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THE SKI-RUNNER

BY

E. C. RICHARDSON.

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PREFACE.

When in 1904 I edited and, in part, wrote "Ski-Running," it was my intention in subsequent editions to keep the book in all respects up-to-date. This intention was fulfilled when the second edition appeared in the following year; but since then, owing to differences of opinion, by no means of an unfriendly nature, between myself and my co-authors, it has been impossible for me to make any additions or alterations.

When Dr. Hoek brought out his German book on the subject, entitled "Der Schilauf," it was arranged between us that he should use as much of my matter as seemed good to him, whilst his matter should be at my disposal for any subsequent editions of "Ski-Running" which might appear. This permission he has been kind enough to transfer to the present work.

The book which I am now issuing is thus to some extent based on "Der Schilauf," which in its turn, is to some extent based on "Ski-Running." I soon found, however, when I began to write, that there was much in both of these treatises which I desired to express differently, and that there was a great deal of entirely new matter to be added. The "Ski-Runner," in fact, differs considerably from any of its predecessors. The most noticeable changes are as follows:—The historical chapter has been expanded and brought up to date. The chapter on outfit contains a great deal of information as to the best kind of wood for ski. The technical instruction, particularly that part which

relates to the turns and swings, has been simplified, and, I think, greatly improved. The chapter on jumping has been expanded, and instructions for the preparation of jumping-hills have been added. The remaining chapters, on snow, avalanches, home-made ski, &c., are, at least so far as English readers are concerned, entirely new.

Throughout the book I have somewhat frequently employed the first person singular. I have done so not because I desire in any way to force my views upon others, but, rather, to show that the views expressed are mine, and not necessarily those of all or even of the majority of ski-runners. I have in all cases of doubt given the opinion of the best authorities, and my reasons for agreeing with or differing from them.

In addition to the acknowledgements made in the text, I should like to thank Herr Höyer-Ellefsen, Herr Hassa Horn, and my brother, Mr. C. W. Richardson, for much useful advice and assistance.

DECEMBER, 1909.

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A HILLSIDE. [*Photo by H. Hock.*

General Survey.

LET us begin with a brief description of the ski themselves, premising that the way to pronounce ski is "she," as in "he, she, or it." They are two strips of hard wood, about $7\frac{1}{2}$ feet in length, about $3\frac{1}{2}$ inches in width, and about 1 inch in thickness. One end of each is gently turned up and sharpened to a point. Exact details of construction are given later on, but the above describes the ski in their simplest possible form. In shape they may be compared to the keel of a boat, and, boat-like, their function is to support their wearer on the surface of water. In the case of ski, however, the water is in a solid state and is mixed with air—that is to say, it is snow. The comparison with a boat is, however, useful, for it marks the difference between ski and all other forms of snow-shoe. For, just as a boat travels *through* water, pushing it aside with its bows, so do ski travel through snow, opening up a way for themselves with their turned-up pointed ends. Other forms of snow-shoe must be lifted at every step, but ski are seldom entirely raised from the ground.

Ski are attached to the ball of the foot at a point somewhere abaft the centre of their length. There are many devices for effecting the attachment, but all have this common purpose, that the ball of the foot should be held firmly in position whilst the heel is partially (but by no means completely) free to move up and down vertically.

With these, in principle, very simple instruments attached to his feet, the expert can traverse any snow-covered ground at a rate depending on his skill and strength, on the nature of the ground, and on the quality of the snow with which it is covered.

Now, on level ground it is evident that the propelling force which drives the ski through the snow must be supplied by the runner himself, and he is obliged to slide forwards, advancing his feet alternately, somewhat as in walking. Uphill, too, his progress depends on his own efforts, cunningly applied, in a way to be afterwards described. As soon, however, as the ground begins to run downhill, the force of gravity comes to his assistance, and the ski begin to slide of their own accord. The movement then becomes a sort of upright tobogganing—tobogganing not on a hard track, the direction and gradient of which is already known, but on the unbroken snow of the open mountain-side or of the thick-set pine forest.

And herein lies the chief superiority of ski over other kinds of snow-shoe: ski run downhill of their own accord, other snow-shoes have to be lifted.

The difficulties of the sliding method of progression will, however, at once be apparent, for the ski are long things, and to stand upright on them at all when sliding even on smooth gently-sloping ground requires some practice.

As the ground becomes steeper, so does the speed increase, and, of course, the more uneven it is the greater is the difficulty of preserving the balance. A good runner can remain upright when travelling very rapidly straight over very uneven ground, and it may at once be said that in the opinion of the writer the chief charm of the sport lies in thus boldly encountering and overcoming the difficulties of balance that arise.

It is impossible to give an exact reply to the common enquiry as to how fast one can thus run straight on ski, as the answer depends mainly on the length and steepness of the hill; but the speed must often reach thirty miles per hour, and without doubt, under favourable circumstances, considerably more.

Obviously, however, there comes a degree of unevenness of ground, coupled with speed, which will defeat even the most

skilful ; or some obstruction, as, for instance, a rock or tree may lie in the way, which necessitates a change of direction or a dead stop. Here another difficulty presents itself, for whilst a stop can always be accomplished by means of a fall, it is by no means easy for the uninitiated to stop and remain upright, or, indeed, to exercise any sort of control over his movements at all.

And, obviously, here again, the greater the speed at which one is travelling, the greater the difficulties. The expert can, however, by certain placings of the ski and certain dispositions of balance, turn or stop almost dead when travelling very rapidly. The various methods of executing these manœuvres will be described later on ; for the present it is enough to note that they are feats of balance and that they offer a vast field for the exercise of skill.

It is convenient here to notice that which may perhaps be regarded as one of the incidents of straight running.

I refer to jumping, the principle of which may be explained thus: Suppose that one is running straight downhill, and that a sudden dip is encountered. It is plain that on reaching the dip the speed at which the runner is travelling will cause him to leave the ground altogether, and he will alight at a point further down the hill. The distance travelled through the air will depend principally on the depth of the dip, and on the rate of speed when the dip was reached ; though obviously, if when leaving the ground a vigorous spring is taken, a still longer flight will be accomplished. In this way on a suitable hill great distances may be covered. Sixty feet, for instance, is quite an ordinary jump. But of this, too, more in its proper place. The point to be observed is that whilst the spring itself is far from being easy to execute, the chief difficulty lies in retaining the balance on alighting.

First and foremost, then, ski-ing calls for the exercise and development of balance, a sense which man begins to practice and enjoy from the time when he first totters across the nursery floor. The exercise of this sense enters, without doubt, into all our sports and pastimes, but it enters to an especial degree into horsemanship. Indeed, the kind of skill which a good ski-runner possesses has frequently been compared to that of a good

rider. Ski have in Norway long been nicknamed "the poor man's horse," and in Australia they speak of ski-riding instead of ski-running. In both exercises a keen sense of balance is the first essential. Your downright clumsy man will never make a good rider or a good ski-runner either. A good horseman and his mount seem to unite together to form one organic whole. They gallop together, they leap together, they turn and halt together. There is never any jerking or jagging or abruptness of any kind. It is all done by balance, by an instinctive feeling of what is coming next, and by a precise knowledge of the capabilities and limitations of horseflesh. It is just the same with the skilful ski-runner, who, by dint of long practice, coupled with a natural aptitude, has learnt how to control and humour his ski. The reverse of the comparison also holds good, for, just as the awkward rider tugs and pulls at and finally parts company with his mount, so does the awkward runner strain at his ski and finally suffer a reverse. Here, however, the comparison ends; for whilst, as Mr. Jorrocks observed, a fall from a horse is "a hawful thing," a fall from ski seldom means anything more than a rather amusing roly-poly in the snow.

We touched above on the method of progression uphill, and it is expedient before going further to refer again briefly to this. Those who have no acquaintance with ski-ing have always some difficulty in understanding how it is possible to go uphill at all on the long smooth things. It should, however, be recollected that neither the ski nor the snow are absolutely slippery substances. Hence it is easy to climb gentle slopes on them without any slipping backwards whatever. On steep slopes, however, it becomes necessary to resort to other tactics, the simplest of which is to take a zig-zag course upwards, making long traverses this way and that at a convenient angle. A glance at the opposite photo will show at once what is meant. And here it may be noted that the superiority of ski over ordinary snowshoes again asserts itself; for, whilst the long, narrow, sharp edges of the ski afford a sure foothold on all but the very steepest and hardest of slopes, snowshoes do not permit of crossing a very steep slope, and as going straight up a very steep slope is equally out of the

question, their unfortunate wearer's further progress upwards is (on them, at least) barred.

Let no one, however, suppose that uphill work on ski in winter is easier than climbing on foot in summer. Under exceptional circumstances, as when very rough ground has been levelled up

Photo by] [*E. C. R.*

THE LAST ZIG-ZAG.

by a generous covering of snow, it may be so ; but as a rule it is somewhat more tiring, and may be considered to take about 25 per cent. longer as far as time is concerned. Thus, a mountain which in summer will take four hours to climb, in winter will probably take about five. Downhill, indeed, and even on the level, the advantage is certainly with the ski. But it is well to insist

at this point that ski-ing in mountainous country, delightful though it be, is no sport for weaklings, and that sound lungs, a sound heart, and muscles of at least ordinary firmness, are essential to its enjoyment.

Fortunately, however, for those of us who are engaged throughout the greater part of the year in some sedentary employment, nature has made the kindly provision that our muscles soon grow strong and quickly adapt themselves to any form of new exercise, especially when it is pursued in the invigorating air of the mountains.

In ski-ing, every muscle throughout the body seems to be brought into play, and not the least of its merits is the extraordinary "fitness" which it engenders in a very short time.

It has been the writer's privilege to introduce the sport to a considerable number of his countrymen, whose health at the time was far from being robust, but who soon became capable of making the most arduous mountain tours. It is not, of course, to be recommended to those suffering from serious lung trouble, but for disorders of the nervous system it appears to be a sovereign remedy.

"How long does it take to learn ski-ing?" The question is a natural one, and though it is really not unlike an enquiry as to how long it takes to play the violin, an answer to it of some sort must be given.

Taking the average case, and noting that the average beginner is by no means strong, I should say that ten days' good practice should suffice to enable him to make a tour of four to five hours' duration, involving a climb of 3,000 feet, without undue exertion. The consideration of the average case, however, allows for a considerable margin on either side. There are many who may eventually become good runners who would not be well advised to attempt such a tour so soon, and also there are many who could easily accomplish it much sooner—say, after three days' hard practice.

The former category will include most ladies and all men who habitually lead a sedentary life; the latter will include ladies of unusual strength, and men whose muscles are, thanks

to other forms of exercise, in a normal condition of firmness. Your mountaineer can cheerfully tackle such a tour on his fourth day. The uphill work at least will be nothing to him, and if on the rundown he grows weary through much falling, he will know how to bear his troubles with fortitude.

Ski-ing Ground.

From the foregoing the uninitiated will, it is hoped, be able to form some idea of the attractions of what may be regarded as the purely technical side of ski-ing. It is necessary now to touch upon the surroundings amidst which it may be practiced.

The first requirements are a hilly country and plenty of snow, and these are, fortunately, to be found in winter over a considerable part of the earth's surface. In our own islands the Scotch and Welsh mountains are admirably suited for the sport ; indeed, it would be difficult to find a finer ski-ing ground than the Cairngorms and Grampians, whenever they are covered by a sufficiency of snow. Nor let anyone suppose that this qualifying observation begs too much. Snow is the rule in winter in the Highlands, and by no means the rare exception many people are apt to suppose. It often lies deep on the mountains for weeks at a time, and it is usually good, dry snow, very suitable for our purpose. If proof of this assertion is required it is only necessary to refer to the Scottish Ski Club, the chief object of whose existence is to organize week-end tours throughout the winter.

In Derbyshire and Yorkshire, too, excellent ski-ing is often to be had, and in general it may be asserted with confidence that the opportunities for ski-ing in the British Islands are at least three or four times as great as they are for skating, which, nevertheless, enjoys a much more widely-spread popularity.

On the Continent the sport has, in recent years, come very much to the fore. Starting from Telemarken, a small province in Norway, it reached Christiania about the beginning of the eighties in the last century, and thence it has spread gradually to all the uplands of Europe.

In a subsequent chapter notes will be found dealing with

some of the principal centres, but here it will be sufficient to give a short description of a typical Alpine winter resort.

Such a resort will be situated some 5,000 feet above sea, and within about a thirty-hours' journey of London. For the last few hours the journey will be all uphill, and will be performed either in sleighs or in a mountain railway. The quality of the air will probably be the first thing to impress itself on the newcomer as he mounts higher and higher above the plain. It is

Photo by] [*E. Meerkamper.*

FINE SKI-ING GROUND.

clear and invigorating. It is cold, but it is so dry and still that it does not chill. It is the kind which, in the words of the old Harrow song, "Nerves the limbs that are lazy grown and braces the languid sinew." The snow, which down below was but a sprinkling, as one mounts upwards, gradually grows deeper, and when at last in the evening the hotel is reached, it will be seen to extend as a smooth grey coverlet all over the valley, whilst on the heights above it glows in the light of the setting sun, furnace-like against the deep blue sky.

Outside the hotel are clusters of ski, and busied amongst them a copper-faced individual grumbling to himself. He is the Ski Club Secretary, and is ascertaining the extent of the day's deficit and damage. You will approach him after dinner, when he is on the look-out for recruits and less bitterly disposed towards men and women-kind.

Your bedroom will be small, sparsely furnished, but clean. It should contain a central heating apparatus, which will be found very handy later on for drying wet clothes. You will probably be expected to dress for dinner.

Somewhere or other near the main entrance of the hotel there will be a notice-board, marked "Ski-Club," and before consulting the Club Secretary you will read through the announcements. By so doing you will not only save yourself a great deal of trouble, but if the Club Secretary comes to hear that you have read his notices his gratitude towards you will be unbounded, and he will do anything. He is unaccustomed to such kindness.

The Club Secretary will, in any case, tell you just what to do about ski-ing practice, and you cannot do better than place yourself unreservedly in his hands. But for the benefit of those who may arrive in a winter resort where there is no club secretary, and also in the humble hope of assisting those important functionaries, I have added further on a course of practice for beginners.

In any case, the first few days you will spend with other beginners on the practice slopes near the hotel, tumbling about and gaining a balance. You will vary this amusement with a little skating, but not, I hope, with any tobogganing, for tobogganing is a dreadful waste of time and is really unworthy of your energy.

A Typical Tour.

And now I propose to join my friend the Club Secretary, who is starting off at 10 a.m. with a party to climb the Weisshorn.

The summit of the Weisshorn is 3,500 feet above the valley, and lies at least two miles back, though owing to the clear air it seems far closer. The last five hundred feet of the ascent on

this side is almost sheer precipice, and it seems impossible to reach the summit on ski, but on the other side there is a gentle and easy way up.

There are eight of us all told, including two ladies, and we start off through the village in a line—curious-looking objects, each with two sticks and a fair-sized rucksack on the back. Soon we leave the road and begin to climb upwards through the belt of pine forest, which rises on either side of the valley to the height of 1,000 feet, protecting its inhabitants against avalanches and supplying them with a modicum of timber. The trees however, are cut sparingly, and only under licence from the Government. They are too precious.

Photo by [*E. C. R.*

IN THE WOOD.

It seemed cold at first in the wood, but the gradient is steep and the snow is soft, so climbing is hard work, and we are soon warm enough and to spare. There is still some snow clinging in places to the branches, and as we brush past in Indian file it falls upon us in little cooling showers, sparkling in the sun. After twenty minutes or so of this a halt is called, and as I have hitherto been walking No. 2 behind the Club Secretary, it is my turn to make the track. The Club Secretary drops to the rear behind the ladies, and after a breather we are off again.

Making the track is a good deal harder work than walking

second, but there is a certain interest and importance attached to it. It is the track-maker's business to move upwards at a steady gradient which must be just as steep (neither more nor less) than the least skilful member of the party can climb. He also should avoid zig-zagging more than is necessary. I soon transgress in both of these matters and am called to order by the bad-tempered member of the party, who is growing tired, and who, like all ski-runners, is of opinion that he, and he alone, really understands how to make a good track uphill. Presently, however, my twenty minutes expires, and I thankfully drop to the rear, the man who started as No. 3 taking my place. One more shift and we are clear of the trees, and what I always regard as the hardest part of the day's work is over.

In front of us there now rises a vast upward-sloping field of snow ending in a pass, on one side of which towers the Weisshorn. Below is the village, and—yes, that tiny oblong is the skating rink, and those microscopic dots are couples waltzing, one can hear the "Blue Danube" quite plainly! We feel a certain compassion for the little objects—a compassion such as is felt by gods looking down upon mortals from Olympus.

But meditations of this sort are interrupted by the Club Secretary, who announces that it is time to move on. The snow is more compact now, and climbing is not nearly such hard work. Two or three long traverses and the wood is already far below. It is astonishing how easily and pleasantly one comes upwards.

Presently Brown, who has long appeared somewhat uneasy, and has been peering about this way and that, suddenly breaks from the line and dashes forward at top speed. When twenty yards or so ahead he stops and regards us anxiously. Hastily he unshoulders his rucksack and produces from it a camera, which he discharges as we pass. He then winds it up, re-packs it, and hurries back into line, the worried look having vanished from his countenance.

Upwards and ever upwards! We begin to grow weary, but the Weisshorn grows nearer now, and there is a gentle breeze which helps to keep us cool. When within ten minutes' walk of the pass, the Club Secretary turns off into a sheltered hollow

and announces that we had better lunch there, as there may be a cold wind blowing higher up. So we take off the ski and make a seat of them by placing them on the snow in a long line covered with spare clothing ; holes are stamped for the feet, rucksacks are opened, and parcels of provisions produced. Sardines, sandwiches, cold chicken, honey-rolls, apples, and oranges are the staple fare, and these are washed down with little cups of lemonade. cold tea, and hot chocolate. The tongues of the ladies are loosed to assure everybody that they are quite well, and do not require assistance of any kind whatsoever, thank you. Terribly independent person the modern ski-ing lady !

These mountainside lunches are delightful, and would be quite perfect if the sun always shone and the wind never blew. Sometimes, however, they are marred by chilly draughts, which steal up and down the back, and by stronger breezes which numb the fingers, but usually one is as comfortable as one would be seated on a mossy bank on a hot summer's day.

Ten minutes' traverse after lunch (the snow always seems heavier then) brings us to the top of the pass, whence a wide prospect of valley and mountain stretching to the far horizon. The deepest valleys are filled with rolls of white mist, a sign of settled weather or unsettled weather, I never could remember which.

And now we run down a little way into the shadow of the Weisshorn, and skirt along to yonder ridge, which was invisible before we reached the pass, but which we now see offers an easy means of reaching the summit. It is chilly here out of the sun, and we are glad to put on dry gloves and to pull our caps down over our ears. Our ski bindings freeze solid and squeak and chirrup at every step.

But presently the ridge is reached, and with it the sunshine. Dry gloves are put away so that they may remain dry, and the Club Secretary takes stock of the situation. The question is whether it would not be easier to climb this last little stretch on foot, for the Weisshorn has been wind-swept on this side, and there are patches of bare rock all the way up. One of the party, who is a mountaineer, does not hesitate, and taking off his ski

shoulders them and starts off at once. The rest of us, however, stick to ours. The advantages are at first all with the mountaineer, who quickly gains a lead of twenty yards or so; but presently he comes to a snow patch, and is soon struggling in it up to the waist. We others stalk majestically past, and presently he resumes his ski, only to take them off again at the next bare patch. On such ridges which are partly snow, partly rock, it usually saves trouble to keep the ski on the feet all the time,

Photo by] [*H. A. Thomson.*

ON THE RIDGE.

and to circumvent the rocky parts as far as possible, crossing them carefully when this cannot be done.

But, anyhow, it is hard work, and we are all fairly out of breath when the cairn is at last reached. After half-a-minute, however, such is the quality of the air, we cease to pant and begin to look around.

Far, far below, part of our village is visible as an insignificant grey speck. Our valley, too, and other valleys, have become quite unimportant, and their presence in the landscape is only marked by an occasional narrow bar of dark green which stands for the fir trees on the sides. What we perceive is a vast expanse

of mountain-tops extending in all directions as far as the eye can see. On those nearest to us there is a sharp distinction between black rocks, golden snow fields, and blue shadows; but in the distance all is mingled into tiny ripples of translucent blue. The air is quite still on the top of the Weisshorn, and we sit about on the sun-baked rocks, resting and enjoying ourselves, each after his own fashion.

The Club Secretary indicates a tour which he proposes to take next week. It includes a run down an insignificant patch of smooth-looking snow, which looks no bigger than a pocket handkerchief, but which is really a glacier five miles long. A well-known ski-runner is said to have covered it in ten minutes last year, and we are all anxious to test the truth of the story for ourselves.

But now Jones, who is reputed to be the most skilful of the party, begins to bustle about. He polishes the bottoms of his ski, buttons his gloves tightly round his wrists, and fixes his cap. He and the Club Secretary proceed to the eastern side of the mountain (we ascended by a northern ridge) and take counsel together. We others follow. It looks terribly steep, and for the first fifty yards or so a number of ugly-looking rocks break the surface. After that, however, a long, smooth snow slope leads to a rising shoulder some 1,000 yards distant. "I think we can get down there," says Jones; and without more ado he is off. He starts slowly, traversing to the right, crouching and picking his way carefully amongst the rocks; now he turns straight downhill and looks as though he were about to dive headlong over a precipice, but he rounds up and coasts off, still carefully, on the other tack. One more such turn, and he is clear of the rocks, and at the top of the long snow slope, where he stops. He prods the snow with one of his sticks, and next moment is off again, but straight downhill this time and full speed ahead. He seemed fairly large and substantial when he started, but in an instant his size is reduced by a half, and a second or two later he is but a black dot streaming downwards with a little cloud of snow dust following in his wake. The black dot reaches the bottom of the hill, shoots a

little way up the opposing shoulder, and then comes to a standstill.

The words "All right" are wafted faintly upwards, and the Club Secretary, after a tug at his straps and a final polish of his ski on a hard snowdrift, starts off. He takes much the same course, and in two minutes appears as a second black dot beside Jones. Then it is my turn; the wind shrieks past, and as the writer of a book on ski-ing, I, too, by your leave, get down without a fall.

From below we three regard the others, crawling about up there like flies. "What are they about? Why don't they start? Ah, there goes the mountaineer; will he take it straight? No; he is actually coming down in big curves, the miserable fellow." So says the Club Secretary, forgetful of the fact that the mountaineer has passed the fifties, and that the calcareous deposit in his bones no longer allows him to take any risks. He makes his curves well, however, and the smartness of one of them excites the admiration of Jones. He soon runs up to us waving his stick and uttering the war-cries of his craft. Then come the ladies, the Austrian, Brown, and, last of all, the bad-tempered man, who, however, falls half-way down the steep slope and descends to the bottom a whirling conglomeration of limbs, ski, and snow. When he rises his appearance is that of a whiting before it has been fried. He is uninjured but very angry, and when he has cleared away some of the snow from his eyes, ears, and mouth, he thus addresses the male members of the company, the ladies having discreetly moved on: "Why the —— couldn't you —— idiots have told me about that —— rock half-way down?"

We do our best to soothe our friend, assuring him of our innocence with regard to the rock, which none of us encountered, and of the existence of which we could not, therefore, have known. The mountaineer, whilst sympathising, observes that straight-running sooner or later always leads to this sort of thing, an observation which, however, only serves to rouse the bad-tempered man to a fresh outburst of wrath.

We others leave them to argue it out and slide off down the

next hill. It is curious that though the bad-tempered man is always coming to grief over rocks, nevertheless, the running surface of his ski are quite smooth and uninjured.

I do not propose to enter into the further details of our descent. How Jones presently discovers a natural jump over a little cornice, which he negotiates successfully, but over which the rest of us come to grief ; how Brown breaks the point of one of his ski, and has to be provided with the makeshift " tin-toe " which I always carry in my rucksack ; how we all fall about, more or less, in the wood ; and how the Austrian gentleman learns the principles of the Christiania swing. These and fifty more such incidents are crowded into an hour and a-half's keen enjoyment and are the commonplaces of most ski-tours.

" But," I hear someone repeat in astonishment, " I thought you said that thirty miles an hour was the speed downhill. Surely you don't mean you took as long to come down as an hour and a half ? " To which the reply is that last week Jones ran down from the top of the Weisshorn to the valley in twenty minutes, and though that does not work out at an average speed of thirty miles an hour, he must at times have been travelling at a rate exceeding that figure. On tour, however, there is no hurry—one stops for others, one stops to try natural jumps, one stops for refreshment and for many other reasons, and time is accordingly spun out.

Our run to-day has landed us two miles further up the valley than the hotel, and as (strange chance !) a wayside inn conveniently presents itself, and we are all thirsty, we adjourn thither for refreshments. We order hot spiced wine, Glühwein as it is called, and it is brought to us, steaming in long glasses, by a rosy-cheeked, broad-flanked wench, who also undertakes to dry our gloves and caps. Under the influence of this soothing beverage the day's doings are discussed and conclusions are drawn from them. The bad-tempered man is peaceful and friendly, for he is only bad-tempered at heights exceeding 5,000 feet, and the ladies express themselves with more freedom, for the tour is over, and they no longer feel or pretend to feel that they are there only on sufferance.

In half-an-hour's time we are rested and refreshed, and ready for the two-miles level running back to the village. And now a piece of luck falls to us, for who should drive past in a two-horse sleigh just as we are starting but Count Gobbleupsky and his lady, who are staying at the same hotel. We hail them to stop, and borrow a couple of ropes from the inn. These we tie to the sleigh, and holding on to them are towed merrily homewards along the highway.

Photo by] [*Will Cadby.*

A Hill-Side.

THE earliest mention of ski-ing of which we have at present any record occurs in Procopius (526-559 A.D.), who mentions* a race of Skridfinnar—that is, gliding Finns—apparently in contrast to other Finns who did not glide. He does not mention details as to the nature of the gliding instruments, but that they were ski of some kind is obvious.

What, then, was the origin of these ski? We know nothing for certain, and conjectures vary. Mr. Crichton Somerville thinks that the idea of them probably occurred to some "inventive genius" who had previously been in the habit of using pattens for crossing the snow. Pattens, he points out, are of very ancient date. They are mentioned by Xenophon as being worn by the horses of the Armenians, as in Scandinavia to the present day, and they have been, and still are, used in all countries from time immemorial for crossing such substances as snow, mud, sand, lava, etc. In Switzerland they are known as *Schneereifen*, in Norway as *Truger*, and in Canada they appear in the highest state of their evolution as the well-known light snowshoes of that country. Mr. Somerville further considers that "the original ski were probably constructed by the Chukchis, or similar tribes, near the Behring Strait or Sea of Okhotsk. They were formed of elongated frames covered with leather and were modified subsequently as migration increased, forests were met with, and

* De Bello Gothico: Ed. Haury ii., 15, p. 217.
† Ski-running, 2nd Ed. p. 5.

wood was found to be a better and more durable material for the purpose required."

This view has, however, recently been challenged by Dr. Fowler,* who points out that there is little or no evidence in favour of it. Those who hold Mr. Somerville's view lay stress on the fact that the patten is often covered with hide (to prevent the snow from balling and to protect the wood), and that skin-clad ski (so-called Öndurr) are common amongst the people of the far north, the skin being added to make hill-climbing easier. There is, however, no necessary connection between the two facts, skin being used by a primitive people for a great variety of purposes.

On the other hand, there is at least one very early mention of ski which most probably were *not* skin-clad. Writing about 1200, the Danish historian Saxo Grammaticus gives the first account of the Skridfinnar. The account runs thus : " This people is used to an extraordinary kind of carriage, and in its passion for the chase strives to climb untrodden mountains and attains the coveted ground at the cost of a slippery circuit for no crag juts so high but they can reach its crest by fetching a cunning compass. For when they first leave the deep valleys they glide, twisting and circling among the bases of the rocks, thus making the route very roundabout by dint of continually swerving aside, until, passing along the winding curves of the tracks, they conquer the appointed summit."

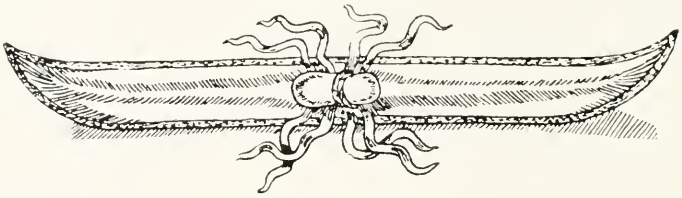
If the ski had been skin-clad there would probably have been little occasion for all this twisting and circling in the only moderately steep mountains of Northern Europe, or at all events it would have been a less noticeable feature. Saxo was, moreover, " a very careful and detailed writer, and would almost certainly have mentioned the hide if it had been in use."

On the other hand, in the picture given on next page, which is taken from Stephanius, an Editor of Saxo, who published in 1644, the ski looks as if it were skin-clad ; but appearing as it does for the first time at this later date, it by no means necessarily represents what Saxo saw.

* Year Book of the S.C.G.B., 1909, p. 62.

The view that ski were not originally evolved from pattens is also supported by the derivation of the word ski itself. "The word," writes Dr. Fowler, "has nothing to do with 'gliding' or 'sliding,' as has been asserted by some writers, but belongs to a group of Germanic words (*Gothic* Skaidan, *German* Scheiden, *Latin* Scindere (scidi), *Greek* σχίζειν, which imply 'splitting.' Ski are and were split or rent from a bit of timber, not sawn out, when properly made. The old Northern word 'skið' means primarily 'split wood' for burning, and in the second place was applied to snow-planks or ski."

"Lastly, it is a fair canon of criticism in the evolution of primitive tools that the simplest is generally the oldest; and nothing can be much simpler than a split lath of wood. That



This, the first discoverable drawing of a ski, occurs in Stephanius, who edited Saxo in 1644.

the ski was evolved by taking a wooden patten, covering it with hide, lengthening it, and then taking away the hide, is, to put it mildly, improbable."

On this point, then, the probabilities seem to favour Dr. Fowler's view.

As to the people amongst whom ski originated, Herr Andreas Hansen, of Christiania, on etymological grounds favours the Finno-Ugrian tribes which, starting from Central Asia, are supposed to have spread north-eastwards as far as Finland, and north-westwards as far as Behring Straits. It seems that words akin to the Finnish word "suksi" and its cognates, which mean ski—not pattens—are at present found in Central Asia as far south as Lake Baikal, and thence across to Mongolia. Mr. J. Marshall, who is an authority on these languages, supports this view, and

infers that ski were known to these peoples at least some thousand years or so before the Christian era, ages before the Scandinavian tribes arrived in their present home. He also states that in winter to-day the Finno-Ugrians and Samoyeds "do all their travelling, trade, tax-paying, fair-visiting, war, and most of their hunting" on ski and in sledges.

The theory is also supported to some extent by the fact that we know from Pinkerton's "Voyages and Travels" (vol. vii., pp. 341-2) that ski were used by the tribes living around Lake Baikal as long ago as 1719.

Still, etymological evidence is by no means conclusive evidence, and I am loth to be driven from my pet theory that ski were invented by a Scotchman—probably by a Scotch engineer. Such a one may very well have been in the service of some Finno-Ugrian chief living near Lake Baikal thousands of years ago.

"Many references" (I again cite Dr. Fowler) "to ski-running are to be found in the old Northern literature: Skaði, the giantess who wedded Njord, one of the Northern gods, left her husband and the coast to return to her beloved mountains; she is known as the Goddess of Ski (*Öndurr-dis*). It was the mark of a proper man in the Sagas to be a good ski-runner: for example, Earl Rognvald of Orkney (died 1159), telling in verse his nine accomplishments, ranks ski-running among them.* From the Kalevala, the great Finnish epic, we may see how much the Finns thought of their 'planks.'"†

"Ski have been used in warfare from a very early date in Sweden. It is recorded that King Swerre at the battle of Oslo, in 1200, sent out a captain and company of ski-runners to reconnoitre."

Turning, however, to more recent times, the most important reference to ski-ing is that of Olaus Magnus, Archbishop of Upsala, who, about 1555, published, when in banishment, a book

* Vigfusson and Powell: Corpus Poeticum Boreale, ii., 276. From this poem is taken the motto of the Ski-Club of Great Britain. Many references in the Sagas will be found under *Skið*, in the great Cleasby-Vigfusson Icelandic Dictionary.

† Lemminkaien's Elk Hunt. Crawford's Translation of the Kalevala, 1889; vol. i., p. 177.

about his travels in Norway. It contains much interesting matter, including a description of a hunt and of a race, and is illustrated with pictures. These latter, one of which is here reproduced, are, however, obviously inaccurate. Ski could never really have

From Olaus Magnus, 1555.

been like those shown. Olaus Magnus himself describes the ski as "flat boards curved in front like bows" (just as a good ski should be curved)—the one the same length as the rider, the other a foot shorter; they are covered with hide of reindeer calf.

The first mention of Continental ski-ing occurs in a German author Valvasor, who wrote about 1689 (see p. 583 in the British

Museum Edition), and is very curious. It appears that in those days the peasants of Krain (Carniola, an Austrian province near the Adriatic) were familiar with ski, though, for some unexplained reason, they afterwards gave them up. Valvasor gives the following description: "The peasants in some parts of Krain, especially near Aursberg and thereabouts, have a rare invention which I have never seen in any other land. . . They take two wooden boards, about a quarter inch (zoll) thick, half a foot (Werckschuh) wide, and above five feet long. In front, these little boards are bent and turned up, and in the middle there is fixed a leather strap into which the feet are placed."

He proceeds to describe how the ski were used, laying stress on the fact that in sliding downhill the runner leant well back onto his stick—"*gar fest, ja mit ganzer Gewalt.*" Trees and big stones were circumvented in serpent-like curves (*Schlangenweise*); but if the way were clear (*unverwachsen, unanstössig*) "they ran in good style (*fein*) in a bee-line straight downhill, leaning back on the stick against which the runner supports himself with such power and strength, and as firmly and stiffly as if he had no limbs to his body or no joints whatsoever."

This description is of special interest, in view of the short ski, the serpent-like curves, and the leaning on the stick, which remind one of some styles of running still to be seen.

Valvasor explains that in saying that he has never seen this invention in "other lands," he thereby refers to Germany, Holland, Switzerland, France, Italy, and Spain. He is aware that the Lapps use ski, and gives a long description of their methods, including the use of reindeer skin or sealskin. "But though," he naïvely adds, "the inhabitants of Krain are without such advantage from the reindeer skin attachment, they do not on that account lose anything as far as speed is concerned in running down the snow mountains."

The sealskin question is, therefore, no new one.

Coming to more recent times, there is a description of ski-ing and a good picture of men on ski in a book of travels by De Jong,* a Dutch captain, who described a visit to Norway in his ship in

* Reizen naar de Kaap, etc., etc.

From Berckenmayer, about 1712.

1796. The ski-runners in the picture are, as usual, active in the use of their sticks, and though there is a figure sliding off the roof of a house, he cannot be said to be jumping in the proper sense of the word.

From De Jong, 1796.

A Norwegian tradition, which has been embodied in a delightful poem by Bernt Lund, tells of one Trysil Knut, who lived about the beginning of the last century, and who attained to great skill on ski. Amongst other exploits, he is said to have leapt over the heads of twelve men who stood below a jump he had made on a hillside—not a very notable achievement in the light of modern records.

THE MANNER IN WHICH THE SKIELÖBERE EXECUTE THEIR WELLS AND ASCEND AND DESCEND THE PRECIPITOUS ACCLIVITIES OF THE MOUNTAINS DURING THEIR MOVEMENTS

Drawn [illegible] by W. Westall A.R.A. [illegible] by C. Hullmandel

London Published by J. Murray, Albemarle St. 1825

An interesting description of ski-ing is to be found in Sir Arthur De Capel Brooke's "A Winter in Lapland and Sweden," 1827, from which the two pictures given here are taken. These Sir Arthur explains were drawn by a Norwegian artist. Ski are referred to as "Skie" and "Snow-skates," and he observes of them that "these machines are by no means easy of use where the ground is precipitous." The military use of ski is insisted upon, and fifty miles is put down as a fair day's work

[*From de Capell Brooke.*

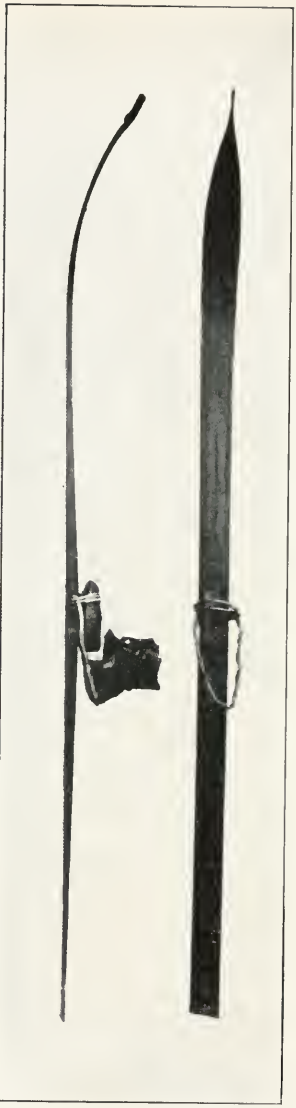
SOLDIERS, ABOUT 1820.

for a Lapp. Norwegian ski are described as being of unequal length, the longer being seven feet long and worn on the right foot, and the shorter five feet long, worn on the left. The ski were "hollowed in the centre of the underside to prevent lateral slip."

Sir Arthur describes the method of using the stick, but significantly adds: "The most skilful do not often make use of the staff, and are above being indebted to it for assistance."

In those early days the use of the ski was certainly utilitarian

Long Ski and Öndurr.



A Pair of Ski owned by one of the first Telemarkings who came to Christiania. Binding of twisted birch bark.

in the main, and ski were employed very generally all over Scandinavia for military purposes and for locomotion in winter. Old State papers have been discovered in Norway showing that competitions for soldiers were held as far back as 1767. The competitions include the shooting off of the gun when running downhill; but there does not seem to have been any jumping.*

Until quite recently every Norwegian valley had it own particular type of ski, though whether the different patterns were really specially suited to local conditions, may be regarded as doubtful. Fashion certainly counted for much. In general, however, we find that very long, narrow ski were used on the hard, wind-driven slopes of the open fjaelds, whilst in the valleys, amongst the trees, a shorter and broader type was the rule.

Now in the province of Telemarken, as elsewhere, the natives evolved their own special type of ski, in the use of which they attained to great skill. The peasants there have been, it is said, from time immemorial expert both in straight-running, turning, and jumping, and have held races and competitions. I have striven in vain to obtain records and particulars of these matters, but the libraries are silent, and it is difficult for a foreigner to hunt up traditions. One is, therefore, driven back upon vague conjectures. Some degree of scepticism as to the great antiquity of Telemark skill seems permissible. Had men been able to leap these vast distances for centuries, surely the world would have heard of it sooner? The fact of the country being mountainous and thickly wooded, which certainly led to the use of shortish ski, seems hardly sufficient to account for the extraordinary proficiency of the people. Short ski have been in use for long periods in other parts of the world, and Telemark ski were used for years both in Germany and Switzerland before their real possibilities were discovered. There are those who would have us believe that in sliding over hillocks the peasants would occasionally find that they left the ground and would take the hint given them by nature, and begin to improve upon it. That

* See the year book of the Formingen til ski idraettens fremme, 1907, p. 76.

seems doubtful. I have seen many a ski-runner who knew nothing of jumping leave the ground by accident, but never a one has returned to perform the feat on purpose. The instinct of all is to keep as close to mother earth as possible. The theory of a gradual evolution of jumping by a whole community appears untenable. It seems more reasonable to suppose that jumping and perhaps, too, swinging and turning without the stick were the discovery of some forgotten genius—possibly of the celebrated Trysil Knut, who, in the course of his wanderings, may have visited Telemarken! Be this as it may, modern ski-ing, with its free, easy carriage and its independence of the stick, comes from Telemark, and as a sport its history may be said to date from the introduction of Telemark peasants to Christiania, about 1870.

Before this time, however, it is interesting to note that ski appear to have been used in Great Britain. Writing in "T.P.'s Weekly," February, 1904, p. 226, "W.T." says that about the sixties in the last century he used to go to school on ski in Cumberland, and that ski were used by the Weardale miners to go to and from their work. Amongst boys of his age jumping was a favourite pastime, and he believes that the practice was a very old one, for he had known boys who had inherited ski from their grandfathers. Ski are also mentioned in "Lorna Doone."

To return, however, to Norway. In Christiania there was in the sixties of the last century "a small circle of wise sportsmen," * who had begun to take up ski-ing.

"In 1870 a pair of Telemarkings were in the capital, and gave an exhibition, and in the following year Telemarkings frequently met there for those ski races which were held."

In 1877 the Christiania Ski Club was formed, and in the early part of 1879† a highly successful and largely attended meeting was held on the Huseby Hill, near the capital. Mr. Crichton Somerville thus describes it:—

"The Huseby Slope was one which, only a few years previously, had been described as highly dangerous, and impossible to descend

* 1908. Aarbog of the Foreningen Til Ski Idraettens fremme.

† Crichton Somerville in Ski-running, p. 9.

when the snow was fast and in good condition. The leaping competition proved most highly interesting, though in some respects quite comical. Every man, except the Telemarkings, carried a long, stout staff, and on that, so they thought, their lives depended. Starting from the summit, riding their poles, as in former times, like witches on broomsticks, checking the speed with frantic efforts, they slid downwards to the dreaded platform or 'hop,' from which they were supposed to leap, but over which they but trickled, as it were; and, landing softly beneath, finally reached the bottom somehow, thankful for their safe escape from the dreaded slide. But then came the Telemark boys, erect at starting, pliant, confident, without anything but a fir branch in their hands, swooping downwards with ever-increasing impetus, until, with a bound, they were in the air, and 76 feet of space was cleared ere, with a resounding smack, their ski touched the slippery slope beneath, and they shot onwards to the plain, where suddenly they turned, stopped in a smother of snow dust, and faced the hill they had just descended! That was a sight worth seeing, and one never to be forgotten, even if in after years such performances have been, in a way, totally eclipsed."

The names of some of the early Telemarkings who took part in this or similar meetings, and who, in the absence of earlier records, we must regard as the fathers of the sport, were as follows:—Knut Olafsen Haugen, Aasmund Braekke, Sveinung Svalastoga, the "Hemmestvedt boys" (Torjus and Mikkel), Halvor Aadalen, Seljord, Svend Juvet, Brunkeberg, Kviteseid, and Vinje.

On the 4th January, 1883, the Norwegian Ski Association was founded, with a membership of 130, and the first meeting was held on the Huseby Hill on the 5th February, in the same year. From the very first, despite the greater popularity of the jumping, the Association has awarded its chief prizes to those who excelled in *both* jumping and long-distance running.

The hill at Huseby, which faced south, and on which the snow was often in bad condition, was changed in 1892 for the world-famous Holmenkollen, which has been used ever since.

Ski-ing is now the national sport of Norway, and has worked

wonders in developing the physique and spirited self-reliance of the nation. The average standard of excellence is, and is likely to remain, in that country higher than in any other, though there, as elsewhere, there are many degrees of skill. The best Norwegian runners are at present unsurpassed.

In Sweden, as in Norway, ski as a means of crossing the snow have been in use from time immemorial. It is only recently, however, that they have been used for other than purely utilitarian purposes. In 1892 the Swedish Ski Association was formed, but doubtless owing to the fact that the country around Stockholm is less favourable than that around Christiania, ski-ing is not the national sport of Southern Sweden, as it is the national sport of Norway. There are two good jumping-hills near Stockholm, the Saltsjöbaden and the Fiskartorpet Hills. A fair number of the Swedes are nowadays skilful runners.

The honour of making the first modern attempts on ski in Central Europe seems to belong to Dr. Herwig, who used ski in Arosa in 1873,* and in the same year the St. Bernard monks also made some attempts. Prior to 1891 other isolated efforts are recorded, as, for instance, some by the Skating Club in Munich in 1889, and at about the same time others at Davos by the brothers Tobias and

A Lapp.
(*London News Agency Photos Ltd.*)

* Von C. Egger ("Jahrbuch des Schweiz," Ski-verbandes, 1909) to whom I am indebted for several other important dates.

Johannes Branger with J. A. Symonds (an Englishman). These were doubtless prompted by accounts of the ski-ing in Norway which filtered through from one source or another—in the case of the Davos efforts, not improbably through the reports of ski-meetings furnished to *The Field* in March, 1888, by "Icicle" (D. M. M. Crichton Somerville).

Then in 1890 came Nansen's "First Crossing of Greenland," published in London in that year, and in the following year in Hamburg. This book, which contains a long and admirable account of the sport written in the language of an enthusiast, created a stir in mountaineering circles. Mountaineering, originally introduced by our countrymen, had for some time been popular in Central Europe, both amongst Swiss, Germans, and Austrians. In winter, however, the Alps were practically a sealed book; for though peaks had been climbed from time to time with the aid of snow-shoes, Schneereifen, etc., the labour involved was found to be so great that such expeditions were rarely undertaken. In the ski, however, climbers thought they had discovered something more serviceable, and experiment soon verified their expectations. In 1893 Dr. C. Staubli and others climbed the Arosa Rothhorn, some of the party being on Canadian snow-shoes. In the same year the brothers Iselin, of Glarus, together with a Norwegian, Ola Kjelsberg, and Dr. Naf, who was on Schneereifen, crossed the Pragel Pass; and in Davos, Lenzerheide, and elsewhere, similar if shorter expeditions were undertaken, in which the superiority of the ski over the snow-shoe for the Alps was once and for ever established. In this eventful year, too, the first Swiss Ski Club was founded in Glarus. The Glarus Club cannot, however, claim the honour of being the oldest in Central Europe, or perhaps even in Switzerland, for in the meanwhile, in 1891, a German club had been founded in Munich, and there is at Davos a record of a "club" being founded about the same time by the brothers Branger. Both of these latter institutions were, however, of an ephemeral character. The Munich Club lived only a year and a half, and never had more than seven members; whilst the membership of the Davos Club seems to have been even smaller, and its life

even shorter. In November, 1892, however, a strong club was founded at Todtnau, in the Black Forest, which has continued to exist ever since, and which may, perhaps, be regarded as the oldest real Continental ski club. The Ski Club Todtnau is now a branch of the Ski Club Schwarzwald, founded in 1895. The Munich Ski Club, however, was soon born afresh, and it and the Ski Club Schwarzwald are of special interest, for from the first they have devoted themselves not only to ski-ing as an adjunct to mountaineering, but also to ski-ing for its own sake.

The first ski races held in Central Europe were those at Mürzzuschlag, near Vienna, in the memorable year of 1893. In 1896 the first races were held on the Feldberg, and in 1897 appeared Herr Zdarsky's "Die Lilienfelder Ski-lauf Technik," which subsequently created so much stir.

The history of the "Technik" and its author is interesting. Zdarsky, painter, philosopher, and hermit, living alone at Lilienfeld, near Vienna, in a steep and thickly-wooded country, at some little distance from civilization, experienced in winter, owing to the deep snow, a difficulty in obtaining stores. He had heard or read of ski, and sent to Norway for a pair. He was not unnaturally dissatisfied with his purchase. Long, grooved, Norwegian ski, with the old-fashioned cane binding,* are unmanageable in such country except by experts. And Zdarsky was no expert in those days, nor had he any teacher who could help him to become one. Most men who tried ski under such circumstances came to the conclusion that they were unsuitable for very steep, wooded ground, even as at the time of writing the Indian Government, basing its conclusions on the efforts of beginners, seems to think that they are unsuitable for the Himalayas. Not so, however, the hermit of Lilienfeld. Instead, however, of struggling with what he considered unsuitable tools, he set to work to alter them, and at the same time to devise a clear and systematic method of using them in their altered form. The result of these labours was the Lilienfeld ski, the Lilienfeld binding, and the Lilienfeld "Technik," above mentioned. The

* When Zdarsky first set to work neither Huitfeldt's, Torgersen's, nor Ellefsen's fastenings had yet appeared.

ski and the binding are criticized further on, and it is unnecessary to refer to them further here than to say that, whilst they have certain faults, they fulfil, on the whole, very well the purpose for which they were intended, which is ski-ing on very steep and broken ground.

The same remarks apply to the "Technik," and had the matter ended with the placing of the ski on the market and the publishing of the book, there would have been little more to say about it. But things did not end there. Zdarsky's invention and his untiring patience in the teaching of beginners attracted many followers. The Viennese are hero-worshippers to the core, and the new disciples soon began to idolize their master. Exaggerated reports of the merits, both of the technique and of the binding, were put about. The latter was advertised commercially somewhat after the manner of a quack medicine. The "Technik," it was contended, was a new discovery and superior to anything which came from Norway. Unfortunately, Zdarsky himself seems to have taken this view and to have proclaimed the newness of his invention. The challenge was, of course, quickly taken up, particularly in the Black Forest. Dr. Paulcke, who had used ski from childhood, and whose crossing of the Bernese Oberland, in 1897, ranked amongst the first notable mountain expeditions on the Continent, placed himself in the forefront of the battle; and Herr W. R. Rickmers, well-known in mountaineering circles, proclaimed himself amongst the most doughty champions of the Lilienfelders.

A controversy in the Press, conducted with much earnestness, but, unfortunately, not always in a friendly spirit, ensued. The details are now of little interest, but unquestionably this war of words served some good purposes. The art of turning downhill on difficult ground was brought prominently to the fore, and its importance to beginners, particularly in the Alps, was emphasized. There is no doubt that the early Norwegian teachers of ski-ing on the Continent had not sufficiently insisted upon it. The gap was filled by the Lilienfelders, and in this way many recruits were won, who would never have taken to ski-ing as exemplified on the jumping-hill. On the other hand, amongst

the Lilienfelders themselves the spirit of enquiry was set on foot. Perhaps, after all, Zdarsky was not the greatest expert in the world, and perhaps, after all, something was to be learned from others. Some had the curiosity to go and see good Norwegian runners for themselves, and were speedily convinced. In 1905 the Norwegian Ski Association sent a representative, Herr Hassa Horn, to Vienna, to report upon the situation. Zdarsky and Horn, finding in each other much to admire, were soon the best friends. The disciples of Herr Zdarsky were captivated by the ease, elegance, and dash of Horn's style of running ; and Horn returned to Christiania with the most favourable opinions of Zdarsky and his method of teaching beginners. The peace of Vienna, as it may be called, closed the controversy. Traces of the dispute, however, still remain, and in the writer's opinion those who have learnt their ski-ing in the Lilienfeld school are still inclined to insist too much on the importance of the down-hill turn, to rely too much on the stick, and, if not actually to discourage, at all events to look coldly upon swift straight-running and jumping.

In the meanwhile, however, whilst the controversy raged, ski-ing was developing rapidly. In 1900 the first Italian ski club was founded in Turin, and on the 6th January, 1903, the first real English Ski Club was founded in Davos, for though there had previously been a ski club at St. Moritz, it was, and at the time of writing, still is, little more than a name. The Davos English Ski Club, on the other hand, imported Norwegian ski, started long and short tours, held instruction classes, and was, and still is, an active and flourishing body. In the same year the Ski Club of Great Britain was also started, its object, which it has faithfully fulfilled, being to supply information to its members as to "How, when, and where to ski." It has instituted a so-called "third class test," the passing of which is rewarded by a bronze medal. Club tours and competitions are instituted, a Year Book and other literature published, and members dine together twice a year. Other British clubs have since sprung up, notably the Scottish Ski Club, in 1907, the most important of which are affiliated to the S.C.G.B., which

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PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

FROM THE STRELA PASS. [*Photo by E. Meerkamper.*

may perhaps be regarded as the M.C.C. of the sport, as far as Englishmen are concerned.

Australia has also now its Ski Club at Kiandra, near Sydney; and in America there are various Clubs. Most of these latter are, however, Norwegian institutions, with spectacular jumping as their chief object. Professionalism seems to be rife in America, whereas in Europe it has been up till the present practically unknown. The Norwegian instructors on the Continent have been mostly young students from Munich, Bern, etc., who have almost invariably had no financial interest whatever in the exhibitions which they have given.

In recent years large ski associations have been formed on the Continent. In 1904 the Swiss Ski Association (S.S.V.) was founded, owing largely to the efforts of the Glarus Ski Club and of the Ski Club Bern. The Association unites some 60 Swiss clubs, with a total membership of nearly 3,000.

In the following year the German and the Austrian Ski Associations were founded. The German Association (D.S.V.) has now a membership of about 13,000, and the Austrian of about 6,000, and these together form the Mid-European Ski Association (M.E.S.V.). The Swiss Association also originally formed part of the Association; but, owing ostensibly to some misunderstanding about the official journal, retired from it in 1908. There is, however, at the time of writing, a probability of a reconciliation and a likelihood that all the different Associations of Europe will be united into one large body

THE SKI.

THE most important part of one's outfit is, of course, the ski, and we will accordingly begin this section with a consideration of them. The subject seems to divide itself best into an examination of (1) the wood from which the ski are made, and (2) the form into which the wood is best shaped, and this is the classification we shall adopt, though incidentally we shall deal with other matters. It is, however, to be noticed that we are not at present concerned with bindings, which will be dealt with separately.

The Wood of the Ski.

The wood from which ski are made should be cheap, hard, springy, tough, and light. It should also be of even consistency throughout—that is, it should not have soft layers which wear away more quickly than the rest of the fibre. Needless to say, though wood of this kind may have grown in the Garden of Eden, it is now no longer available. Hickory would be perfect if it were cheaper, less heavy, and tougher. Ash, too, would be perfect it if were less expensive and heavy, and if it did not contain soft layers. Birch is light, but it is apt to be brittle. Pine, though serviceable, is soft and also brittle, and it would be easy to mention others which are fairly useful but which have more serious disadvantages than those named.

Ash and hickory are the most widely used, and of the two ash is the general favourite. In my view, however, there is really little to choose between the two, in fact my preference is rather for hickory. I have in my possession a pair of hickory ski which have been subject to the roughest usage throughout two seasons, but which are now as sound as ever. It is true that they are somewhat heavy, but not, I think, heavier than if

they were made of the best ash. Their running surfaces have remained most beautifully smooth, and their edges are practically unimpaired. They are just a little stiffer than ash ski, which may be a disadvantage, as stiff ski are generally more likely to break ; but so far they have stood the test. They are, however, a specially selected pair, and probably of more than average merit.

My preference for hickory is, however, supported by the fact that it is now much more widely used in Norway than formerly, but this, on the other hand, may be due to the increasing scarcity of good ash. On the whole, it seems that it is with hickory as it was with the little girl who, when she was good was very, very good, but when she was bad was horrid. Probably, therefore, it would be safer to buy ash ski, unless special facilities are offered for hickory.

But before proceeding to treat of ash, which it is proposed to do at some length, it will be well to refer briefly to birch and pine. The great merit of these woods is their extreme lightness and cheapness. It is indeed surprising that they are not more widely used by those to whom these qualities are of special importance. Swedish ski, and those of similar type which are employed in the north of Norway, are mostly made of birch impregnated with tar, and this material is found to be quite strong enough for all ordinary purposes.

Gamekeepers, shepherds, postmen, etc., in the snowy districts of Scotland, to whom the cost of ash must be a serious consideration, would probably be well advised to make their ski of good pine or birch ; and ladies, children, and elderl · men who do not or cannot put their instruments to the shocks incurred in jumping and fast straight-running, would find the lightness of birch a great comfort for touring. A friend of the writer's used a pair of pine ski for many years, during which he was by no means tender with them and which served him admirably.

Fashion is, however, potent in these matters, and it is doubtful whether any Norwegian or Continental maker keeps birch ski in stock. It would, however, be easy to have them made to order, and once their merits were discovered they would, I venture to think, come much more largely into vogue.

At present, however, ash holds the field, and to its consideration we will accordingly now proceed.

To begin with, it is to be observed that all ash is not equally good. As far as I am aware, all that comes from America, and much that comes from Central Europe, is to be eschewed. Genuine Norwegian ash is excellent ; but nowadays it is growing scarce, and considerable quantities of American ash are used in that country. Danish ash, and the best German and Swiss ashes are good. I have no personal knowledge of our own ash, but if carpenters are to be believed, it is excellent. Good, well-seasoned ash is to be recognized by its weight. Bad ash is light ; good ash is heavy. But, of course, this test only holds if the wood is thoroughly dry, for bad damp wood is as heavy as good dry wood. No ski-maker of repute is, however, so foolish as to make his goods from damp material, which would, of course, warp and become worthless almost immediately. The weight of an ash ski is accordingly a very fair test of the merit of the wood from which it is made.

Another test is the "grain." The chances are considerable that if left to himself the novice would select a ski with a "nice close grain," and if this book serves him in no other way, it should at least save him money and disappointment in warning him against this very common error. The less grain there is about an ash ski the better, and the closer it is the worse. The grain of the wood represents that portion of the tree that has grown rapidly in the spring, and which is more soft, porous, and brittle than that of the rest of the year. This soft wood is not only a source of weakness, but, on the running surface of the ski, it soon wears away, leaving in its place a series of little rough grooves, which by increasing the friction make the ski slow downhill and very liable to clog if the snow is inclined to be "sticky."

The trees which are to be used should be cut in winter before the sap begins to flow freely. They should be cut into planks, in a manner to be presently described, and these should be allowed to dry slowly for at least a year before they are used.

The best wood for making ski is that which is cut from the outside of the lower part of the trunk.

Let us examine the cut surfaces of a tree which has been sawn down. We shall find them to consist of a number of rings composed of light and dark wood. The rings represent a year's growth of the tree, the dark part of them being the soft wood above mentioned. The rings are close together near the centre of the tree, but grow wider apart towards the bark (see Fig. 1).

The part which is most suitable for ski is that which is nearest the bark, and we shall cut planks as shown at A rather than as at B or at C. The reason for this will be apparent when we examine how the layers of good and bad wood lie in the planks so cut.

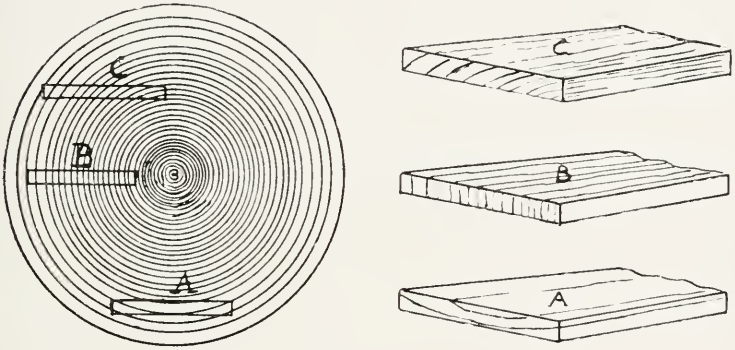


Fig. 1.

It will be seen that A is composed of a few deep layers of good wood placed one on the top of the other, and that there is little bad wood.

B consists of a number of layers of good wood placed alongside one another, and there is a great deal more bad wood.

In C the layers are placed diagonally to one another, and there is an intermediate quantity of bad wood.

The arrangement of good wood in A, in fact, resembles that of the leaves of this book when the pages are being read ; in B it resembles that of the leaves when the book is stood on end on a bookshelf ; whilst in C the arrangement is intermediate.

Now, apart from the extra proportion of good wood which A contains, it is to be observed that this arrangement of it in

horizontal layers is preferable to that at B or C, as possessing more elasticity in the direction required, for the strain placed on the ski is always a vertical one, and as in A the layers lie above one another, ski made of such planks will bend considerably before they will break.

A still further advantage of wood cut close to the bark is that such wood is naturally more resilient than that cut near the centre of the tree; for as the tree when growing bends this way and that, such wood is exposed to, and has to adapt itself to, a greater strain in all directions.

Everything, therefore, points to the selection of wood cut from this part of the tree. Ski made from wood cut as at A (Fig. 1) are in Norway called "bottle" ash ski. Bottle, because the arrangement of layers sometimes shows itself on the running surface of the ski in shapes which, I suppose, resemble that vessel. The perfect bottle ash ski would, of course, show no such pattern, as the layers of good wood would lie quite horizontally one above the other, but in practice this is scarcely attainable, and the layers always "run out," as it is called, more or less.

Now, this very "running out" of the grain deserves very careful consideration. It is caused, of course, by a more or less faulty cutting of the planks from the trunk; thus, if instead of being split quite truly down the grain the plank is cut somewhat crossways, as shown by the dotted lines in A, Fig. 2, such a plank

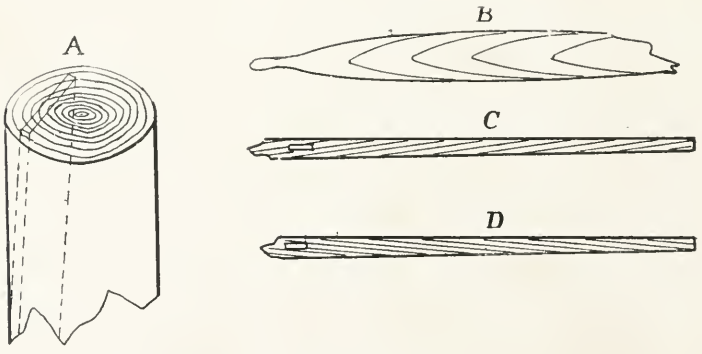


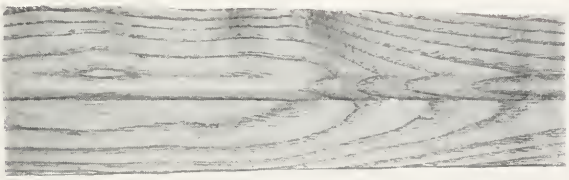
Fig. 2.

will have out-running grain as shown in B, C, or D. If the running out is but slight, and if the ski be fashioned so that it occurs only in a direction leading from the toe of the ski to the heel, as at D, and if, furthermore, it does not occur either at the upward bend in front, as at B, or immediately under the foot, it may be pardoned ; but all ski which have out-running grain in a direction from heel to toe, or at the bend, or at the middle, should be broken up and sold for firewood. The objection to even slight running out from heel to toe is, of course, that as the ski wears down and as splinters form, these will point forwards and so impede progress ; whereas, if they point backwards they will do less harm.

To summarize :—

The reader will be quite safe it he chooses ash ski, though he is invited to experiment with hickory and birch.

His ash ski should, however, be fairly heavy, and should have as little grain about them as possible. It is preferable that the grain and good wood should be in horizontal rather than vertical layers. Such layers should, in any case, "run out" as little as possible, and that little should not be at the bend or under the foot, and should be in a direction running from toe to heel, and not *vice versa*.



This photo shows the grain on the running surface of a ski made of "bottle" ash.

Fig. 3

Telemark Ski.

Fig. 3 shows the type of ski which is recommended to the average reader for all-round service. Ski of this pattern, or of an approximation to it, are made by all the best manufacturers in Norway and on the Continent.

They are made in different sizes, and the ordinary rule for the selection of a suitable size is that the ski should be so long that its tip reaches to the middle of the fingers when the hand is held above the head (see Fig. 4).

Ski of this type are similar to those which have long been in use in Telemarken, and they are generally known as Telemark ski. There are but slight differences between the forms made by the best Norwegian and Continental makers, and these, to the beginner at least, are of little or no importance. There are, however, unfortunately, a number of inferior brands on the market, and to enable the reader to detect these, and at the same time to enable him to appreciate the advantages of the best forms, it will be well to direct his attention to some of the points of a really good article.

Fig. 4.

Before doing so, however, it is expedient to come to an understanding about the terminology we are to employ.

It will be observed from the diagram that the ski has two bends in it, one running throughout its entire length, forming a gentle arch so that when unweighted the ends alone stand on the ground : this we shall call " the arch " ; and the other, the upward turn in

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NEAR LENZERHEIDE. [Photo by Chr. Meisser.

front, which in future we shall call "the bend." The front end of the ski which contains the bend we shall call "the point," and the back end "the heel." That surface which is in contact with the snow we shall term "the running surface," and that opposite to it "the upper surface." In most ski the running surface is broken by a little hollow running from the heel to the beginning of the bend, this we shall call "the groove." The other terms do not require any special explanation.

Now, the first thing about a ski is that it should be strong enough to support the weight of the runner, but that it should not be built more heavily than is necessary. Good wood cut as explained in the preceding section, and fashioned according to the shape shown, Fig. 73, will ensure proper strength; and all that need be mentioned in this connection is the rounded upper surface with which some Telemark ski are furnished.

The rounded upper surface lightens the ski to some extent, and at the same time does not impair strength. In some measure, too, it prevents loose snow from settling on the ski and so adding to the weight. It has, however, a tendency to make the ski somewhat stiff, and care should be taken that the roundness should gradually cease towards the bend, which should, as we shall see presently, be springy and easy. The rounded upper surface is not a matter of great importance, and very excellent ski are made without it.

It is most important that a ski should be absolutely "true"—that is to say that a straight line drawn from the point of the toe to the middle of the heel should divide it into two exactly similar halves. For a ski which is not true will run in a curve instead of a straight line; and if, as not infrequently happens, its neighbour has a twist in the other direction, their opposite tendencies downhill are apt to become a source of embarrassment to their wearer.

If the wood from which the ski were made was ill-seasoned it is by no means unlikely that the ski may already be warped before they have left the shop. This can usually be detected by the eye alone; or if a pin be driven into the middle of each end, and a

thread stretched between them, the defect will at once become apparent.

The edges of the ski should be sharp, but not too sharp, else they will be liable to break and splinter.

It will be observed from the diagram that the sides are slightly curved—that is to say, that the ski are broader at either end than at the middle. It has been thought that this curve somewhat assists turning, but to my mind this is questionable. The curve is, I think, rather the result of the desirability for breadth at the bend, and of a corresponding slight increase of breadth at the heel to balance it, than of any design for a *special* purpose. Certainly, the curve should not be exaggerated, for if it is it becomes difficult to obtain a grip with the edge of the ski on steep, hard slopes.

The purpose of the arch is to prevent undue bending in the opposite direction when the ski is weighted by the body of the runner. Its total height should not exceed three-quarters of an inch, and care should be taken not to exaggerate it. A ski which is too much arched will run on two ends only instead of on the entire length of its surface, and this greatly lessens the speed. A slight arch is, of course, serviceable, but too little is better than too much.

A skilfully-fashioned bend is the hall-mark of a first-class ski. The bend should begin very gently and subtly, and should on no account be abrupt and exaggerated. A total rise of five or six inches, vertically measured, is amply sufficient. More than this only throws the ski upwards to an unnecessary extent when glissading, the speed is thereby diminished, and the risk of breakage increased. For it is at the bend that a ski is most likely to break. Nor is the safeguard against breakage to be sought in thickness of wood at this point; on the contrary, within certain limits, a thick bend is more liable to break than a comparatively thin one, for its stiffness prevents it yielding and so surmounting unevenness in the ground.

The bend of a ski should resemble that of a good bow, so that it should be impossible to say just where it begins.

The whole of the front part of the ski should, in fact, be more

or less resilient, and so lend, as it were, a graduated assistance to the bend proper. It is easy to test this with the hand before purchasing. Fig. 5 shows a good and bad bend.

The ski should be somewhat broader at the bend than elsewhere, for a broadish bend, which is at the same time thin, will be both strong and springy, and may accordingly be made somewhat flatter than one which is narrow. Those of us, too, who have large feet will find a broad bend a special advantage, as opening up a wide channel and so causing less friction of the boots against the snow.

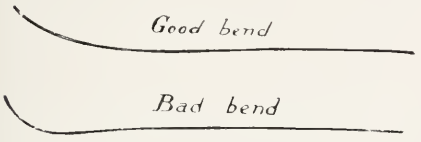
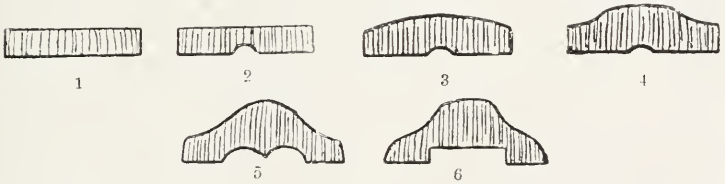


Fig. 5.

The groove on the running surface is next to be noticed. Its object is to steady the ski for straight-running by preventing them from slipping sideways. In this respect it may be compared to the keel of a boat, which exists for a similar purpose. Just as, however, a boat's keel may be too long or too deep to permit of easy steering, so may the groove on the running surface of a ski be exaggerated to such an extent as to interfere unduly with turning.



SECTION OF SKI.—1, No groove. 2, 3, 4, Telemark Ski of different patterns. 5, 6, Swedish Ski.

Fig. 6.

The groove which has been found most serviceable in ordinary ski is about one-twelfth of an inch deep, and is rounded in shape. In Swedish ski it is about one-eighth of an inch deep and rectangular in shape (see Fig. 6).

The Lilienfeld ski have no groove. I have, however, come across Telemark ski without any groove (some of those used by the first peasants who came to Christiania had none), and I have also seen Telemark ski with three grooves. I

once owned a pair of Telemark ski of ordinary dimensions with a very deep (about three-eighths inch) single groove, and though they were very pleasant for straight-running they were very difficult to turn.

I have also used Telemark ski without a groove, and Lilienfeld ski with one, and can testify to the great difference to straight-running and turning which the presence or absence of this feature causes.

I lay stress upon these facts because some Continental writers, preferring *a priori* to empirical methods of argument, have gone so far as to maintain seriously that the groove makes no difference at all!

The next feature to be noticed is the hole near the middle. This hole in the form of a narrow slit usually exists in Telemark ski, and is made for the attachment of the binding. It has been urged against it that it unduly weakens the ski at a point which is particularly vulnerable, but when all is said and done the binding has got to be securely fixed to the wood somehow, and it is questionable whether any arrangement of bolts or screw nails do not do as much, if not greater, damage.

As to the colour which the sides and upper surface should be painted. In Norway black is much in vogue, and looks smart enough. But it has two disadvantages. Firstly, it conceals the grain of the wood, so that it is difficult to tell just what one is getting underneath the paint; and, secondly, in sunny weather the black paint is apt to become hot. This does not happen often in Norway, where the rays of the winter sun are not very strong, but in the Alps it occurs frequently. The consequence is that any snow which falls on the upper surface partially melts and sticks there, adding considerably to the weight. I have over and over again seen black ski thickly covered with snow in this way, whilst plain varnished ski were quite clear. The trouble is not, of course, so common early in the year, but there is always a risk, which it is quite unnecessary to incur and which one avoids simply by using plain varnished ski. On æsthetic grounds, too, I prefer to see the grain of the wood, which, to my mind, is preferable to black paint.

1 2 3 4 5 1 2 3 4 5

1. Ski from Meraker, Norway.
2. Telemark Ski. (Modern.)
3. Lilienfeld Ski.
4. Ski from Ural Mountains.
5. Stockholm Ski.

It has, however, been urged in favour of black ski that they are a preventative against snow-blindness as giving the eye something to rest upon when all around is white. The replies to this are: (1) that if the black is covered with white snow it is no longer any use; (2) plain varnished ski afford very nearly as much rest to the eye; (3) snow-blindness is not prevented at all by such a trifle.

If, however, one already possesses a pair of black ski, and if the sticking to the upper surfaces becomes troublesome, the evil may be mitigated to some extent by waxing (see below).

The ski can, of course, be painted other colours than black—white, for instance!

The running surface of the ski should be smooth, but should not be varnished. I have seen beginners in terrible straits with ski which have been varnished by ignorant makers. A judicious coating or two of linseed oil mingled with a little paraffin may, indeed ought, to have been applied, and in Sweden and in some parts of Norway they apply some preparation of tar, but nothing in the nature of varnish or paint is to be tolerated.

Swedish Ski.

The next type of ski to be mentioned is the Swedish. As will be observed from the photo, page 57, it is long and narrow, and possesses (see Fig 6) a deep, rectangular groove. Swedish ski are commonly made of birch, for ash in such large dimensions would be too heavy. They are very useful for the purpose for which they are intended, which is level-running, or glissading on gentle slopes where no turning is required.

Ski of this type or of an approximation to it are also common in Lapland, in the north of Norway, and generally on the highlands or *fjaelds* of Scandinavia, where their great length is of value in crossing the lumpy wind-driven snow so common in these districts. For crossing such lumpy snow the bend of the Swedish ski is, however, somewhat too short and abrupt, and the Norwegian ski used on such ground are usually better provided in this respect (see the pair of Meraker ski shown, p. 57).

Special ski for use on the *fjaelds* are obtainable in Christiania, the form known as Captain Roll's model being perhaps the best. I have personally no experience of these, but their inventor, who is one of the best jumpers and all-round men in the country, has had a long experience of the *fjaelds*, and may be trusted to have evolved something really serviceable.

Nevertheless, unless we were going to devote a considerable time to touring in such country, it would scarcely be worth while buying a special pair of ski.

I have myself paid four visits of several weeks' duration to the Norwegian and Swedish *fjaelds*, and have always managed very well with ordinary Telemark ski, and this also has been the experience of many friends both English and Norwegian. On one occasion, indeed, when touring with a party in Sweden, several of us bought Swedish ski, but after a trial or two most of us relinquished them in favour of the ordinary model.

Lilienfeld Ski.

The last type of ski to be mentioned is the Lilienfeld (see p. 57).

There will be, doubtless, some amongst my readers who will be of opinion that no mention should be made of this type, which they believe, and I think rightly believe, to be a bad one.

The Lilienfeld ski are, however, still used by a considerable number of runners, and for that reason alone they must be described in a book of this kind. A picture and criticism of them will, moreover, enable the reader to understand what are their bad points, and possibly to adopt certain advantages they may have for a special purpose.

The wood of the Lilienfeld ski is commonly of inferior quality. Exceptions may exist, but as the commercial article is invariably sold with the heavy and expensive metal binding bearing the same name (of which more in its proper place), I am inclined to think that on grounds both of weight and of commercial expediency an inferior wood is habitually chosen. The defect is not, however, an inherent one, and if the form were otherwise good it might be pardoned. This, however, is not the case. The arch in new Lilienfeld ski is commonly too great, though

in course of time it usually disappears, the wood often taking a contrary curve. The bend is very abrupt and stiff, and rises too high off the ground. The rounded point purports, I believe, to prevent the ski sticking in loose brush wood, but ordinary ski do not give much trouble in this way, and I have not found that the Lilienfeld give less. It is true that if one has very long ski, and if one falls forward much, there is a remote danger of one's eye coming in contact with the point, and perhaps in such a case it would be prudent to round off the point; but the Lilienfeld ski are always short, and on them such an accident would hardly be possible, as the points would not strike so high as the eye.

The running surface of these ski contains no groove, and to this omission, coupled with the abrupt entrance which checks their speed, and with the fact that they are relatively shorter and broader than ordinary ski, do they owe the ease with which they can be turned.

The Lilienfeld ski are, in fact, the exact opposite of the Swedish ski, they are very unsuitable for straight running, being slow and "wobbly" in all directions, but they are very easily turned. In this, indeed, consists their one and only merit, and there can be no doubt that the reputation for easy steering which they have gained is attributable far less to their binding than to the three points in their construction above named, viz.: their flat running surface, their shortness, and their abrupt entrance.

Now, ease of turning is, beyond question, a most desirable quality in a ski, and if it could be had without other sacrifices we should all unhesitatingly accept it. But, unfortunately, it is not so obtainable. It cannot indeed be too strongly emphasized *that all ease in turning is only bought at the price of unsteadiness in straight-running, and that all ease in straight-running is only bought at the price of increased difficulty in turning.* Once this very simple proposition is understood and accepted, the whole problem of ski construction becomes greatly simplified.

All that, then, remains to be considered is: (1) What degree of ease in turning or straight-running do we require? (2) What sacrifices are best made to attain the end in view?

These questions we shall now consider, but before turning to them we may dismiss the Lilienfeld ski. For absence of groove and comparative shortness are qualities which may equally well be embodied in Telemark ski, and as to the bluff entrance of the Lilienfeld, whilst, no doubt, it somewhat assists turning by diminishing the speed, clearly too great a sacrifice is made for the trifling assistance gained—an assistance which, for that matter, could be equally secured by driving a few nails into the bend of an ordinary Telemark ski.

Straight-running requirements v. Turning requirements.

What, then, are (1) our requirements as to straight-running on the one hand and turning on the other, and (2) how are these requirements best attained ?

Clearly, the answer to the first of these questions must remain to some extent a matter of taste, and all that can here be done is to point out how tastes have in fact varied, and to record one's own opinion.

The reply to the second question will be given incidentally.

In what the Germans call Mittelgebirg—that is to say, in countries like Norway, Scotland, and the Black Forest, which are fairly mountainous, and which afford many easy facilities for straight-running, but where the ground is not usually so steep or so difficult as to call for much manœuvring—there has been a very general opinion in favour of the compromise afforded by the ordinary Telemark ski, used in the size recommended above ; that is to say, of such a length that the tip reaches to the middle of the fingers when the hand is held at arm's length above the head. Such ski are excellent for straight-running, their length and groove being adjusted so as to afford great steadiness, whilst these features are not carried to such an extent as to render the ski unmanageable to people of ordinary skill. Amongst experts indeed there has been a tendency to use somewhat longer ski, for experts are both able to turn more easily than ordinary runners, and are also able to avoid the necessity for so doing by taking

difficult hills straight, at a rate of speed which the ordinary runner dares not attempt.

For such countries, then, ordinary ski may safely be recommended to all but experts, who, of course, already know very well what suits them best. But opinions have differed as to what is best for ski-ing in the Alps.

The ground there is, in general, both steeper and more broken, and in the course of an ordinary tour a good deal of turning and manœuvring is always necessary; add to this the fact that the general standard of running is, in the Alps, very much lower than in Norway, and the demand for increased steering facilities there at once becomes comprehensible.

In the early days of ski-ing in Central Europe this demand was indeed much greater than now, and that for two reasons: Firstly, because most people possessed no skill whatever in managing their ski, and were foolish enough to blame their implements rather than themselves; and, secondly, because the bindings then in use were for the most part defective in construction. Nowadays, however, when most of the bindings in use are firm and serviceable, it is fairly generally realized that still further steering facilities can only be bought at a price; and there is, consequently, a tendency *to use ski of the ordinary Telemark type and size even in the Alps;* and this is the advice which I would tender to the active beginner, whose age does not exceed, shall we say, forty.

Those whose activity is slightly impaired would, however, probably do well to choose rather shorter ordinary grooved ski, reaching, say, to the base of the wrist instead of to the middle of the fingers; for not only will such ski be easier to turn, but they will, of course, also be lighter for uphill work. Straight-running up to quite a reasonable speed will also be fairly easy on such ski.

But for those whose limbs are growing stiff, or who for other reasons are unable to risk a fast glissade, I would recommend ordinary ski reaching to the base of the wrist, but *without any groove.* On such ski they will be able to turn very easily, and so suit the speed to their requirements.

It may be thought that by thus reducing the length, and so diminishing the total area of the supporting surface, an increase in breadth should be made, and possibly for short, heavy people some compensation in this respect may be expedient. I do not think, however, that a ski should ever be *absolutely* much broader than the dimensions given in that shown, Fig. 73, though, of course, the adoption of these dimensions to a shorter ski will increase the *relative* breadth.

Breadth in a ski is indeed a disadvantage in this way, that, whenever one is *traversing* a hard slope, the broader the ski the greater is the strain placed on the ankles to hold it edged. Fig. 7 shows in an exaggerated form what is meant, better than a long explanation.

Fig. 7.

This disadvantage is, of course, specially marked on slopes where the snow is hard. It applies, however, to a greater or less extent everywhere, and not only is it a cause of fatigue, but it is also an occasion for unsteadiness in glissading, every little hillock at right angles to the runner's course tending to throw him off his balance.

Broad ski are, therefore, to be avoided.

As regards the extra sinking in, however, which is occasioned by using smaller ski, no serious apprehension need be felt. I can speak to this from personal experience, for when I first started mountain touring I used to employ very tiny ski, reaching not much higher than my shoulder. Their running surfaces were clad, as the custom was in those days, with sealskin (of which more in its proper place), and as far as uphill work is concerned they served me admirably, and in all but the very softest new snow—a condition in which nowadays no one will attempt a long expedition. Downhill, of course, my tiny ski used to run their points under, and wobble to a degree which rendered fast straight-running, and even turning, upon them a matter of the greatest difficulty, and, in consequence of this, they have for years lain unused. But as far as mere crossing of the snow is concerned, both up and down hill, I think that they were a distinct saving of energy.

It is possible, therefore, that gear of this kind, though perhaps a little longer—say, as long as the runner himself—might be of service to rock climbers in winter who desire to husband as much strength as possible, and who on occasion may want to carry their ski on their backs whilst they clamber over passes, etc. For work of this sort extreme lightness and shortness is of course an advantage.

I am inclined to think, however, that few rock climbers, once they have tasted the pleasures of a swift glissade on suitable ski, will feel disposed to sacrifice that even to their beloved rocks. At all events, up to the present, I have not met any such.

Summary.

To summarize this section :—

If you are a person of ordinary activity, choose normal Telemark ski, reaching to the middle of the fingers, for *all* work. If your activity is slightly impaired, use such ski reaching to the base of the wrist, retaining the groove. If, however, you are unable to go in for straight-running, and must have great facilities for turning, then order (and order well in advance : it is improbable that you will find them ready-made) Telemark ski reaching to the base of the wrist, without any groove. It will, after all, be easy to have the groove cut later on, if desired.

I have in this section purposely omitted all reference to jumping, not because I consider it unimportant, but because its consideration has been irrelevant. It may now, however, be observed that normal Telemark ski are admirable for jumping, and short grooveless ski are unsuitable for precisely the same reasons which render these suitable and unsuitable for straight running.

A good pair of ash or hickory ski costs from 12s. to 20s., depending upon the size.

THE BINDING.

Until within the last year or so the binding was a fruitful cause of controversy, both friendly and hostile, amongst ski-runners. It raged, perhaps, most keenly on the Continent, but it extended also in some measure to Norway. The pendulum has now,

however, swung in the opposite direction, not because the problem of the best fastening has been solved, but because runners have for the most part grown weary of it. Moreover, we, who are not Norwegians, have come to appreciate the fact, long appreciated in that country, that as far as steering is concerned the form of the ski themselves is at least as important a factor as the fastening; and also, as our skill has increased, that, after all, the steering of ski is more a matter of adjustment of balance than of brute force applied through the binding.

Nevertheless, it may be that the reaction has been too great. For, whilst it has been said with much justice that the chief thing about a binding is that it should fit, the dictum is surely not to be extended to mean that every binding which fits is equally good. Many of the useless mechanical inventions, for instance, fit perfectly.

The binding problem, to my mind, really remains only partially solved, and though the outlook for inventive genius is not encouraging, the vast bulk of new inventions having been in the past just so many failures, it is, nevertheless, to be hoped that improvements will be forthcoming and that nothing hitherto discovered represents the acme of human ingenuity in this direction.

Requirements of a Good Fastening.

What, then, are the requirements of a good fastening? They may be enumerated as follows:—

A really good binding should be

(1) strong,
(2) light,
(3) compact,
(4) easily repaired,
(5) such that the foot is secured to the ski in a peculiar manner to be presently described,
(6) easily put on and taken off,
(7) cheap
(8) comfortable

Most of these requirements speak for themselves, but with regard

to the manner in which the foot is secured to the ski an explanation is necessary.

The foot must be secured so that *under all ordinary strains* it is rigid as far as lateral movement is concerned (that is to say, a line drawn down the centre of the foot should always be in the same plane as a line drawn down the centre of the ski), whilst the heel is partially free to move up and down vertically. I write " under all ordinary strains," for it is eminently desirable that in the event of a severe fall the fastening should, without breaking or becoming detached from the foot, " give " as much as possible. Up to the present, however, nobody has succeeded in inventing anything in other ways unobjectionable which satisfies this requirement.

The heel of the foot should be *partially* free to move up and down vertically. This vertical movement should be such that the heel can rise easily for a distance of three inches or so from the ski, after which the heel should be checked mechanically by the binding so that it rises with increasing difficulty till the runner can just kneel comfortably on the ski (see Fig. 8). If he can do this the binding may for practical purposes be considered safe as far as a fall forward is concerned. An extra measure of safety is, indeed, secured by a still freer forward movement of the heel, and this is arranged in the Lilienfeld and similar bindings, but only at the price of the vertical control to be mentioned presently.

Fig. 8.

The reason why the vertical movement of the heel should be checked *mechanically* by the binding, why, for instance, a simple toe-strap or its equivalent is insufficient, is that, as the ski is brought forward when sliding on the level or uphill, a considerable strain is thrown onto the foot. This strain should be divided up as far as possible all over the foot, and should not be con-

centrated on one point only ; an arrangement whereby the heel is free to rise for a short distance, but afterwards begins to take its fair share of the strain, is thus expedient.

The vertical movement should also be such that it is in the power of the runner when the ski is lifted clear of the ground to raise and lower the point *at will.* This is most useful when side-stepping uphill and also in jumping.

In most bindings it is effected by a strap across the toes attached to the ski, and, of course, the further the toe is thrust into the toe-strap the greater is the control. It is, however, to be noted that it is in the highest degree dangerous to take advantage of this to any but a small extent, and *care should be taken that the toe-strap never reaches further down the foot than the joint where the big toe joins the foot.*

Some Well-known Bindings.

Let us now see from the examination of a few well-known bindings how far our numerous theoretical requirements have been carried out in practice. It is proposed to discuss several fastenings, which, though they are not finally to be recommended, have, nevertheless, some good points about them. These the ingenious reader may be able to incorporate into some more perfect form. I may perhaps be permitted to add that I have used all the fastenings here named, and speak of them from considerable personal experience.

Fig. 9 shows a variety of the "cane" binding which was invented to take the place of the withes of twisted birch which were used by the Telemark peasants. The foot is held in front by a simple strap across the toes, whilst a piece of cane steamed to the shape of an oval passes round the heel. The fastening has the merit of affording just about the right degree of vertical freedom, but in a lateral direction it is scarcely firm enough for any but easy country

Fig. 9.—Cane Binding.

where there is little traversing of steep slopes to be done. It is easily taken on and off, but it is so bulky that the feet have to be held somewhat apart for level running or uphill work. The cane part of it, too, is apt to break; though, on the other hand, that is very easily repaired.

The binding is still used to a considerable extent, both in Norway and Sweden. It costs about 4s.

Fig. 10 is known in Germany as the "sole" binding. It consists of a simple toe-strap, of a sole made of two or three thicknesses of the "belting" used for driving machinery, and of a leather heel fixed to the belting.

The belting is fixed to the ski in front of the toes, either by screws or by means of a thin piece of metal of this shape ⌐¬ The heel is kept in place by a strap round the ankle.

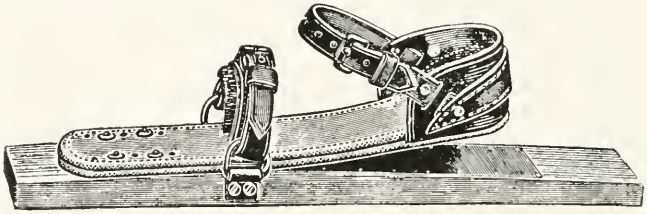


Fig. 10.—Sole Binding.

This binding at first sight seems admirable, but it is open to many serious objections.

Snow is apt to collect inside the heel, to melt partially, and to be pressed into ice which it is troublesome to remove. The toe is apt to be galled by being pressed up and down by the belting against the toe-strap. And then, as to rigidity. Either the belting is so stiff that there is not enough vertical play, or so thin that the sole buckles, and so permits of too much lateral play. It is, however, very easily taken off and on.

The fastening costs about 10s.

The Lilienfeld fastening, depicted in Fig. 11, consists of a thin steel plate, to which are attached adjustable toe and heel pieces, so that it may be readily fitted to any boot. The plate is attached to the ski in front of the toes by a hinge, and a degree of vertical rigidity is given to it by an ingenious spring arrange-

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FRAUENKIRCH. [*Photo by E. C. R.*

ment. It has been urged against the Lilienfeld binding that it is specially dangerous, but I have not seen more accidents with it than with others.

In a lateral direction it is absolutely firm, and it is also very easily taken on and off. But on the other hand, it possesses disadvantages which, to my mind, are fatal.

The vertical *control* which we saw above to be desirable is absent, for the toe-strap, whereby this is effected in other

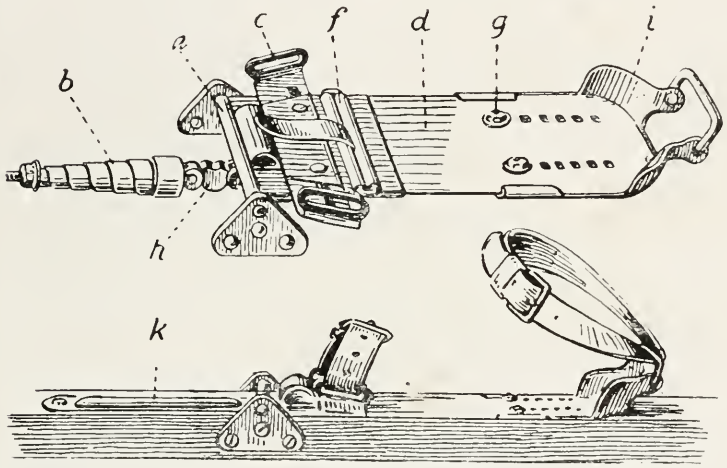

Fig. 11.—Lilienfeld Binding.

(*a*) Axle. (*b*) Spring. (*c*) Toe-pieces. (*d*) Steel sole. (*f*) hinge. (*g*) Nuts for moving out heel-piece. (*h*) Hinged rod. (*i*) Heel-piece. (*k*) Cover for spring.

bindings, is attached, not to the ski, but to the moveable plate, which, in its turn, is attached to the ski *in front* of the foot.

The mechanical vertical movement is also imperfectly arranged by the spring, for either the spring is so loose that too much strain is thrown onto the toe of the foot, or it is so tight that the back of the ski is raised from the ground at every step. In addition to which, should the heel of the ski be caught in the ground through, say, a step backwards, the power of the spring at moderate tension is insufficient to enable the runner to extricate the heel. This last objection I once saw well illustrated in practice on a very steep slope. The runner, who, hitherto, has

been a strong advocate of the binding, was unable to free his heel from the snow and had to call for assistance.

The chief claim urged on behalf of the fastening is that it permits of better steering of the ski than any other, but this, as we saw in the last chapter, is largely to be attributed to the kind of ski which are usually supplied with it, and which are in other respects objectionable.

The steering facilities afforded by the fastening are indeed great, but not greater than are afforded by many fastenings which, in other respects, are not open to such serious drawbacks. Modifications of the fastening in which the hinge and spring principle is preserved are the "Bilgeri" and "Austria" bindings. Price about 15s. and 10s. respectively.

The cost of the Lilienfeld binding is about 17s., with straps.

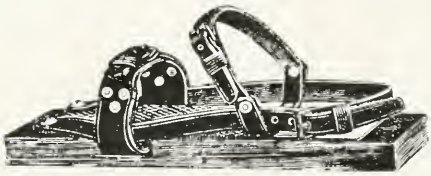

Fig. 12.—Torgersen's "Handy" Binding.

Fig. 12 shows the binding known as Torgersen's "Handy" Binding. It is in principle somewhat like the "sole" binding; but the toe-straps are stiffened by a thin piece of metal inside them, and the belting ends abruptly half-way down the foot. There it is secured by a strap passing round the instep, whilst another strap fixed to the ski in front of the foot leading right round the heel also helps to keep the foot in place.

This is really a useful binding, and I am surprised that it has not more friends than it in fact possesses.

The vertical movement is about right, but in a lateral direction the rigidity is somewhat below modern requirements.

The fastening is not, however, liable to clog up with snow, and it is very easy to take on and off. Its chief merit, however, is that it can be easily adjusted to almost any boot, a fact which renders it very suitable for club ski and the like.

The fastening costs about 5s. 6d.

Fig. 13 shows the fastening known as Huitfeldt's Binding, Model A.

It consists of (1) a stout iron toe piece bolted through the ski, (2) a toe-strap, (3) a thong of raw hide seven feet long by half-an-inch wide, similar to that used for lacing together the belting of machinery, to be had at any engineer's supply shop. The thong is furnished with a loop at one end; it is doubled at the loop end and passed through the hole in the ski below the toes, and fixed round the foot, as shown in Figs. 13 and 14. The adjustment of the thong looks complicated, but is really so simple that anyone who takes the trouble can learn how to tie it in two minutes. For those, however, who, for some reason or other, cannot be troubled with the thong (and, indeed, it is rather troublesome to adjust when the fingers are cold, and has also a bootlace's tiresome habit of breaking when one is in a hurry), the arrangement of straps shown in Fig. 15 is to be recommended. This arrangement is also the invention of Herr Huitfeldt, and when the binding is sold in this form the toe-pieces are usually formed by a four-cornered Bessemer iron plate, 16-20 centimetres long, 5 centimetres wide, and 2 millimetres thick. The middle of this plate is cut out, and a piece of leather (to prevent chafing of toe-straps and boots, a purpose which it fulfils but imperfectly), is attached to one side of it. The iron toe-pieces are then thrust through the hole in the ski, and bent round to fit exactly

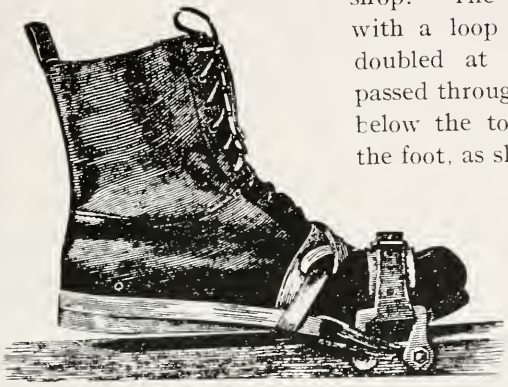

Fig. 13.—Huitfeldt's Binding, Model A.

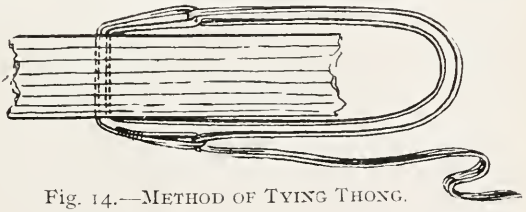

Fig. 14.—Method of Tying Thong.

to the sole of the boot, after which they are held in place by means of small wooden wedges thrust into the hole in the ski.

A very useful addition to this fastening is Höyer-Ellefsen's clamp (Fig. 16), which, when shut, pulls the side straps to which it is attached quite tight, but which, when open, allows the binding to be taken off and on very easily.

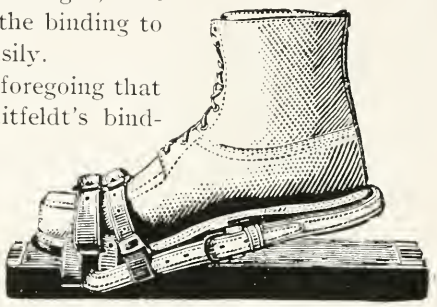

Fig. 15.—Huitfeldt's Binding, Model B.

It will be seen from the foregoing that the principle of both of Huitfeldt's bindings is the same. The foot is held in position by the toe of the boot being wedged between two iron cheeks, or toe-pieces, on the side of the ski. It is, therefore, of the highest importance that these toe-pieces should themselves be wedged firmly into place, and that they should fit the sole of the boot exactly. It is also important that the sole of the boot should be very stout and strong, both so that it should not buckle under the pressure placed upon it, and in order that it may stand the wear and tear just where the toe-pieces come.

When securely fixed, the binding in either of the forms shown is admirable, and enjoys a popularity considerably in excess of any other. The toe and heel straps (or thongs) allow of a suitable

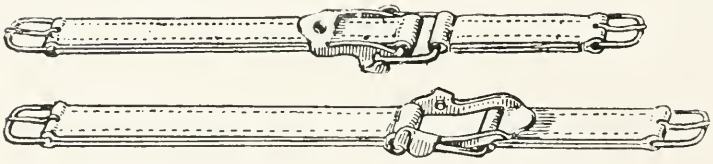

Fig. 16.—Ellefsen's Clamp (closed and open).

vertical movement, and the binding, as a whole, is light, strong, compact, and, with the Höyer-Ellefsen clamp, very easily taken off and on. When used with the thong arrangement it is really simplicity itself, and is on that account greatly to be recommended as a "home-made" binding. For any black-

smith can make toe-pieces similar to those shown in either of the figures, and leather thongs are procurable almost anywhere.

Indeed, the binding is used so widely and is recommended with such emphasis by so many ski-runners of much greater skill than mine, that I almost tremble to criticise it at all. Still, I must retaliate on my friend and co-author, Dr. Hoek, who uses the fastening, by saying I am not the only one who has experienced difficulties with it, and must record my vote with the minority who do not like it. I may perhaps plead in extenuation that I was amongst the first to use the fastening when it appeared in Norway in '96, when the metal part of it was viewed with a great deal of suspicion by many.

The chief difficulty I have experienced is not so much in getting the binding to fit as in keeping it fitted. However accurately I adjust the toe-pieces to the sole of my boot, I find that the latter soon works loose, either (in the case of the bent iron plate) through the wear and tear gradually forcing the toe-pieces apart, or through the sole itself being worn down by the toe-pieces, or by the toe being insufficiently wedge-shaped (*e.g.*, with comfortable square-toed boots) to be gripped firmly by the toe-pieces, or by the straps or thongs which pass round the heel stretching.

With me, in fact, the binding has either to be so tight as to be uncomfortable, or so loose as to be unserviceable. These difficulties may, of course, be due to the fact that as I weigh about thirteen stone the strain on the arrangement may, in my case, be too great ; but as some of my friends who are light have had the same trouble, I am doubtful even of this.

There is, however, another fault about the binding which is acknowledged by everybody : it is that the heel-straps project from the sides of the ski just where they enter the hole below the toes. In loose snow this is not a serious defect, though even there the projections must to some extent act as a brake ; but on slightly crusted snow, such as is encountered to *some* extent on most ski tours, the projecting straps are liable both to trip one up and also to be cut or worn.

In some other bindings of similar type efforts have been made

to overcome this objection by fixing the heel-straps higher up; but devices of this kind minimise one of the fastening's chief merits, which is the suitable vertical movement which it affords. The most noticeable of these are the Schuster Hoek binding, Christiansen's binding, and Branaes's binding. Huitfeldt's bindings cost about 5s.

Fig. 17 shows the fastening which I have used with much satisfaction ever since it came out in 1904, and which I am, therefore, naturally disposed to recommend. It is fair that I should add that I had, when it first appeared, a mild pecuniary interest in it, with which, however, I have since parted; and that it was invented by an old friend of mine.

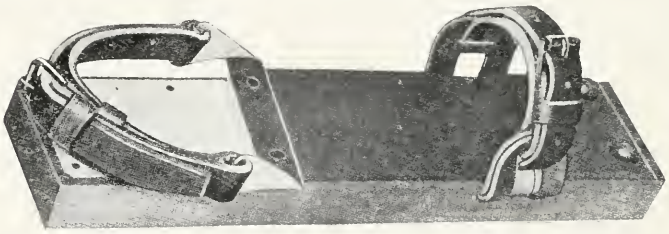

Fig. 17.—Ellefsen's Binding.

The binding is called Ellefsen's, and consists of:

(1) Iron toe-pieces.

(2) A sole made of double belting, secured in front of the toe by screws, and immediately *under* the toes by little iron tongues which form part of the iron from which the toe-pieces are made.

(3) Iron heel-pieces with straps passing round the heel, as shown in the diagram.

Lateral rigidity is thus secured in two ways by the toe-pieces (as in Huitfeldt's), and by the iron heel-pieces; for it is obvious that so long as the belting is stretched taut by the heel-straps, it is impossible for it to buckle.

The vertical movement is suitably regulated by the toe-straps and by the stiffness of the belting, which is held in place, not as the sole binding in front of the foot, but immediately under the toes. The fixing of the belting at this place also prevents any

galling of the upper part of the toes against the toe-strap, as is apt to occur in the "sole" binding.

The chief advantage of the fastening, to my mind, is the division of lateral strain above mentioned. The consequence is that for all ordinary work the foot need not be wedged into the toe-pieces so very firmly, for the heel pieces take a good deal of the strain; the belting, too, need not in practice be pulled quite taut, for though it may buckle a little and so permit of a little lateral play, there soon comes a point beyond which no force the wearer can put forth will displace it further.

The binding when worn just a little loose in this way is very easily taken on and off; for if the heel-strap be kept secured, the whole fastening forms a kind of outer "form," in or out of which the boot may easily be passed.

Some objections to the binding are: that it is not quite safe (though not, I think, more unsafe than any other form of fastening on the market); that the iron toe-pieces, even when padded with leather, are apt to wear away the side of the boot (a disadvantage it shares with Huitfeldt's); and that the binding is difficult to repair if it breaks.

This latter fault is, of course, a serious one, the more so as, unless the fastening is made of the very best material throughout, breakages are liable to happen.

The weak spots are: (1) The two places where the belting is held under the toes by the little iron toe-pieces, and where, unless the belting is first-class material with plenty of india-rubber in it, tears are apt to occur; and also (2) the heel-pieces, the ears of which, unless made of the best material and of suitable thickness, are liable to break off.

It should, however, be added that so long as the iron toe-pieces stand (and I have never heard of them breaking), it is always possible, with the aid of a stout thong or spare straps, or even a piece of string, to rig up some sort of a makeshift after the manner of Huitfeldt's binding, which will take one home.

Another objection raised to the fastening is that it is apt to gall the heels; for the radius of the belting is greater than that of the sole of the boot, and there results from this a dis-

placement of the foot inside the boot or a pressure of the leather at the back of the boot against the heel every time the foot is raised.

I have not personally suffered in this way, possibly because the outer cuticle of my heels may be extra hard, or possibly because I always wear the binding just a little loose, or possibly because I am very particular about the fit of my boots round the instep. Several of my friends, however, have been troubled with such galls. A partial cure, or at least a relief, should they occur, is to buckle a strap round the boot and fastening at the instep.

Fig. 18.
(*a*) Space between heel-pieces and heel of boot. (*b*) Screws to secure belting.

The criticism is, however, valid, so far as it holds good, and it is no answer to it to say the trouble occurs with other bindings besides Ellefsen's, though it is fair to state that I have known it to happen even with the Lilienfeld, which theoretically should be quite free from such a vice.

It is finally to be observed that in ordering this binding, either an outline of the sole of the boot, or, better still, the boot itself, should be sent with the order; for the heel irons are made in different sizes, and the whole arrangement requires rather careful adjustment. In some ways it is a drawback that the binding will not fit everybody, in others an advantage, for it affords an admirable excuse for refusing to lend one's pet ski to careless friends.

To Fix the Ellefsen Binding.—(1) Attach foot-plates as recommended, p. 78; (2) adjust the belting with heel-pieces attached, as shown in Fig. 18. Note that the dark side of the belting should be undermost, and that the left and right heel-pieces are recognizable by the way they point across the ski. A small space should be left between the heel-pieces and the heel of the boot, and the boot should be placed in such a way that when

the toe-pieces are fixed the toes do not project too far forward. Then screw down the belting in front. (3) The toe-pieces are then adjusted. They are passed through the hole in the ski so that an even quantity projects on either side. One of the little iron tongues (c 1, Fig. 19) is then marked and bent upwards, and afterwards the other on the other side. Both are then bent right over and the belting secured by them. The rest of the iron is then bent round to fit the boot, as shown (4, Fig. 19). These operations must be performed in a vice.

The fastening costs about 5s. 6d.

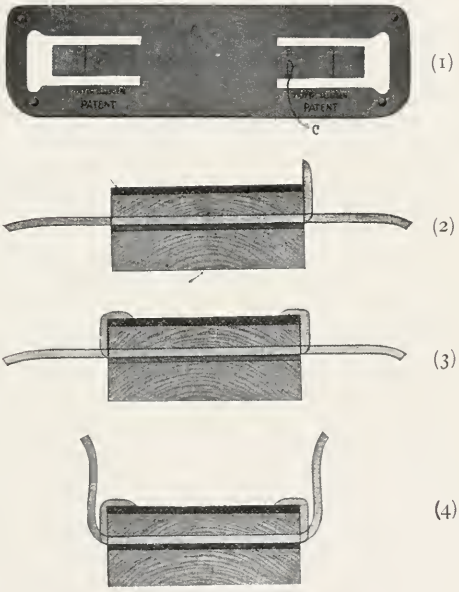

Fig. 19.

Conclusion.

This finishes the list of bindings which I propose to give, for though there are many others which are more or less serviceable, they all, so far as I am aware, resemble one or other of those named.

All the bindings mentioned can be used for jumping, though the Lilienfeld, owing to its lack of vertical control, is little suitable for the purpose. It was at one time thought that considerable vertical stiffness of a mechanical nature was necessary to prevent the points of the ski from flying up in the air when leaving the take-off, and the Huitfeldt binding was highly praised as affording this stiffness to a greater extent than most others. But since Herr Huitfeldt himself has tried experiments by placing weights on the back of the ski, and since he has declared (with an impartiality which others might do well to imitate) that the point

may be kept down with other fastenings, even with a simple toe-strap without anything else, and since, moreover, he devotes a large portion of his book to this depressing of the points of the ski which he considers all important,* we may, I think, fairly assume that no specially stiff vertical movement is necessary, even supposing the depressing of the points to be a matter of paramount importance.

To summarize this section :—

The binding question is still unsolved, but Ellefsen's or Huitfeldt's supply the best answers to it.

Take care that both these fastenings fit accurately, and beware of thrusting the toes too far into the toe-straps.

FOOT-PLATES.

In order to prevent the snow from collecting under the sole of the foot and sticking there to the upper surface of the ski, and also to protect that surface from the wear and tear of the boot, it is usual to use some sort of foot-plate. Birch bark or a piece of sealskin are usual in Norway, but these materials serve the purpose but imperfectly. A piece of celluloid does very well and will last a long time, but perhaps the simplest as well as the most durable is a very thin piece of metal, such as brass or zinc. Aluminium is much used, but is too soft, and hence apt to tear ; magnalium is admirable if available. The metal is best secured at the corners by small screws, and elsewhere by a few plain nails. Plain nails alone are apt to draw.

STICKS.

There is a good deal of difference of opinion about sticks, some people recommending two, others one, and yet others no stick at all.

The third alternative may be dismissed at once for all kinds of work except jumping, in the exercise of which the holding of a stick in the hand is dangerous. It may, indeed, be advisable for the beginner to practice occasionally free-handed, but for practical

* "Ski löbning i text og Billeder," page 5.

touring in difficult country a stick (or sticks) is almost a necessity.

It is therefore bad policy to get into the habit of making all turns and swings on the practice ground free-handed, as, subsequently, on tour, one's sticks are apt to be embarrassing. It by no means follows that just because sticks are held in the hands they should be used on all occasions. On the contrary, it may be stated here once for all that the more one can execute with the ski alone the better, and one should from the first try to dispense with such *assistance to the balance* as sticks may afford.

Nevertheless, sticks have a use, and there is an art in using them, as will be explained later on. In support of which I may say that a friend of mine, a first-rate Norwegian runner, who had previously been inclined to scoff at those who used them, observed, on returning from a trip to Switzerland, that he had learnt a good deal in that country, and, amongst other things, how to use his stick.

The choice, then, lies between two sticks and one.

It is curious to note with regard to this question how extremes meet; for the chief advocates of the single stick are now what may be called the pure Telemark party in Norway, headed by Herr Huitfeldt, and the Lilienfeld party, headed by Herr Zdarsky, who, as far as most ski-ing questions are concerned, represent opposite poles (excuse me) of opinion.

The objection taken to two sticks may well be stated in Herr Huitfeldt's own words. He says: "The use of two sticks is not only ugly, but also stands opposed to the very essence of ski-running. So long as one has two sticks to support one, one will never learn to use ski correctly, and place the weight of the body just where, under different circumstances, it is required. The tendency is, for instance, to use the arms uphill in cases where the weight of the body *alone* should usually be sufficient. The use of two sticks is also apt with an unpracticed runner to bring about a position with the legs apart."

Herr Zdarsky, too, has amusingly described the users of double sticks as "Siechen Spitalbrüdern" (sick brethren of the infirmary). So that the reader will see there is considerable weight of authority against them.

Nevertheless, the great majority of ski-runners, skilful and unskilful, including the writer, use them habitually without anything very dreadful happening, and my experience is that whilst I have seen many a beginner *try* to go uphill with two sticks, after the manner of a cripple on crutches, I have never yet seen one who succeeded in doing so for any length, either of distance or time. The effort involved is really too great to be sustained, and everyone, sooner or later, gives up the attempt. Once, however, that the correct way of going up a hill is learnt, there can be no doubt that two sticks are a great assistance. The same observation applies also to level running, and if two sticks do incline to develop the muscles of the arms and shoulders, and if they do assist balance, these, to my mind, are no disadvantages. Few people, after all, experience much difficulty in balancing themselves tolerably well either uphill or on the level. It is downhill that most of us come to grief!

There can, however, be no talk of two sticks being of much service for downhill work. On the contrary, one of the objections raised to their use is that they get in the way and are troublesome to manage. To overcome this difficulty there have been invented from time to time various arrangements whereby the two sticks may be fixed together when required. I do not, however, propose to reproduce any of these here, for the reason that none of them work well in practice, and also because they are wholly unnecessary. No one who actually uses two sticks ever experiences any difficulty in handling them downhill, for either they are held by the side quite naturally, one in each hand, or else, when they may be required as a brake, they are simply held together and used just like a single stick. Everybody can do this easily, and no apparatus to keep the sticks together is required.

A more substantial argument in favour of the stout single stick is that on hard and dangerous slopes it may be thrust deeply into the snow, and so afford something to hold onto in case the ski should slip. And certainly if one is going to make a habit of searching out and ski-ing on such snow, a single stick would be best for it. Luckily, however, such conditions

are not common in practice, and where one *does* come across them it is surely safer to take off the ski and walk.

I have in my possession a pair of sticks which I bought in Stockholm and which have served me very well for three seasons. They are similar to that shown (Fig. 20). The bamboos of which they are made are cracked in many places, but I have bound them round with waxed string, and they are practically as strong as ever they were. They reach to about my shoulders, a height which is quite long enough for any stick, anything beyond that being only so much useless weight to carry. The way in which the wicker rings at the bottom are fixed (see Fig. 20) is excellent, but is not, unfortunately, universally adopted. It enables the stick to move freely in any direction. The commonest method of fixing the rings is to make a hole in the bamboo and pass a leather thong through the hole. This is thoroughly bad, as the edges of the bamboo cut through the thong in no time.

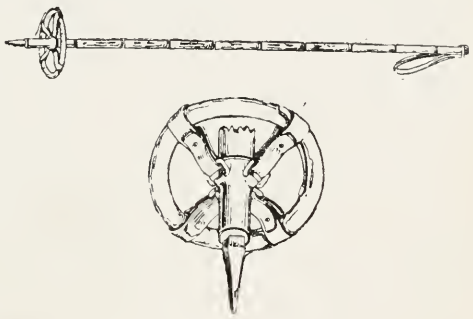

Fig. 20.

The wicker rings are, of course, to prevent the sticks sinking into the snow. To be useful they should be of good size. They considerably increase the effectiveness of braking with the sticks in soft snow, but on crusted snow they are apt to catch and throw one off the balance. It would of course be easy to invent some way of taking them off and on, but on tour one can not be bothered with too many appliances.

Really good bamboo sticks of this description are, for some reason or other, rather difficult to obtain, the commercial article being as a rule weak and flimsy, as well as expensive.

Anyone, however, who has the time can easily make his own sticks. The materials required are strong bamboo, leather thongs for hand and discs, spike for bottom, and wicker for

the discs. The discs can be webbed with the thongs and lashed on to the bamboos. Fishing tackle or oil and colour shops will supply most of the materials.

Good bamboos are certainly lightest and best, but if they are not obtainable, there are to be had, in Switzerland at least, very good hazel sticks, provided with wicker rings. These are, of course, a trifle heavier and also less stiff than bamboos, but they are, practically speaking, unbreakable, and perhaps on that account may be recommended to heavy beginners.

Summary.—Use double bamboo or hazel sticks reaching to the shoulders, provided with biggish wicker rings, suitably fixed.

SEALSKIN, &c.

The device of attaching the skin of some animal, seal, elk, or reindeer, to the bottom of the ski is, as we have seen, a very old one. Sealskin is the material most widely used. The hairs, which are laid to point backwards, enable one to climb uphill at a steeper angle than with the plain surface. This is specially useful when the snow is either very slippery (*e.g.*, covered with big crystals of hoar frost) or very hard, or both. On ordinary snow the gain is not great.

Another advantage of the skin is that snow which is partially melted and inclined to stick to the plain wood will not stick to the hair.

So far all is to the good, but there are also disadvantages. These are that sealskin adds to the weight, that it greatly diminishes the speed downhill, that covering the groove as it does it makes the ski unsteady (easier to turn) for downhill work, that though wet snow does not stick to it, nevertheless, if, as once happened to me, it should freeze after it has been wetted, the ice so formed can only be removed by scraping away the hairs.

Fixed Sealskin.

There is, in consequence, nowadays, a very general agreement that *fixed* sealskin is to be avoided, and in this view, as far as pure ski-running is concerned, I certainly concur. I think, however, that for winter mountaineers, etc., who may want to use ski as a

mere means of crossing the snow with a minimum of effort, and who care nothing for fast straight-running, sealskin fixed to the short ski mentioned on page 63 still affords the best solution of their problem.

The skin used is that of the common seal (*foca vitulina*), and it is attached to the bottom of the ski thus :—

Cut with a sharp knife strips of the skin of the width of the ski at the broadest part, and long enough to extend well up the bend. See that the lie of the hair is exactly parallel to a straight line drawn down the centre of the ski. One long piece of skin is, of course, the best, but if the hair does not run true, two or more pieces must be taken.

Make in a suitable vessel a sufficiency of thickish paste by stirring rye flour with boiling water, and adding thereto a little Venice turpentine. Anoint pretty thickly the under surface of the ski with the mess. Take one of the strips of skin, and, with one tack only, tack it to the ski (see that the hair runs the right way, *i.e.*, from toe to heel), then stretch it gently down the ski, temporarily tacking it at the heel. Next tack firmly at the toe, and, beginning there, press the skin strongly into contact with the wood, pulling it as tight as possible. Put in a couple of tacks about the middle. Stretch and squeeze. Remove the temporary tacks, and refix at the heel. Then tack at intervals of a couple of inches or so all the way along both sides. See that the heads of the tacks are small and lie flush with the surface of the skin. Lastly, pare off any skin projecting at the sides. Let the paste have time to dry before using.

Detachable Sealskin.

It of course soon occurred to many of us that some at least of the objections to sealskin would disappear if the skin could be taken on and off the ski at pleasure, hence a great number of devices.

The problem to be solved is to invent something which (1) is light but strong, (2) which can easily and quickly be taken off and on, (3) which will not wobble about when fixed, but will adhere tightly to the ski.

Alas! so far the wit of man has been baffled; and it may be said at once that there is nothing on the market which comes within reasonable distance of satisfying these requirements. The chief difficulty to be overcome is, indeed, the squaring of the circle, for the running-surface of the ski is arched, and nothing short of actually sticking the skin onto it all the way along will ever keep the two together. In practice snow collects under all detachable skin and so adds to the weight, and for little downhill runs such as occur on most tours the skin wobbles about and interferes with the balance.

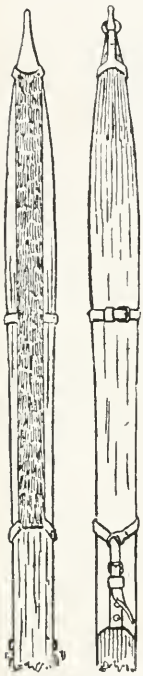

Fig. 21.
DETACHABLE SEALSKIN.

Of all the devices more or less complicated which have been invented to solve the problem the least objectionable and simplest is probably that shown in Fig 21.

It consists of a strip of skin sown onto a piece of webbing, which extends for half the length of the ski only, and is fixed as shown by means of loops and buckles.

I do not propose to produce any others for the reason that, though I have tried most of them, I have not found any which was not a great deal more trouble than what it was worth.

OTHER AIDS.

In addition to sealskin, all kinds of apparatus in the nature of braking appliances, lee-boards to prevent slipping on hard slopes, etc., etc., have been brought out, and in some cases patented. With regard to such, I can only say that I advise the reader to have nothing to do with them, not because they are objectionable *per se* as being apparatus, but because they either do not fulfil the purpose for which they are intended, or do so only at the cost of something else, usually lightness, which is more valuable.

There is, however, one little dodge which may be mentioned. It takes the place of sealskin for uphill work, and is both simple

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TILDEN FOUNDATIONS

TRACKS. [*Photo by E. C. R.*

and effective. My attention to it was called by Mr. H. Gandy, and I append a description of it in his own words :

"Take 14-ft. of hard cord rather thicker than that used for window blinds. Double it, and wrap it with fine twine at three inches from the double, thus making a loop to fit the tip of the ski. Then similarly fasten the doubled cord together every six and a-half inches till you have done so eight times—nine joins including the first one. If you have not any fine twine handy with which to make lashings, knot the thick cord together instead, taking an extra foot of length to allow for the knots. You will then have made a kind of net which slips over the front part of the ski very easily.

"To put on, remember to put the loop next the two free ends of the string over the tip of the ski first, the others follow in order, the last fitting the ski tip. Pull all tight, and make fast the loose ends through the toe-straps, heel-straps, or round the ankles.

"To take off, loosen the fastening and pull the ski back, when the whole thing comes off. With a pair of these you can walk up the most slippery mountain and, in case of accident, have 28-ft. of good cord at immediate disposal. The weight of the pair is about three and a-half ounces.

"This arrangement is cheap, light, easily taken off and on, and does not slip about. Moreover, the back part of the ski is unencumbered, and need not be lifted from the snow in climbing."

For long stretches of climbing the cord is unquestionably useful, though the beginner should not get into the habit of relying entirely upon this or any other extraneous aid. In every tour there are little pieces of alternating uphill and downhill work for which it would be quite absurd to stop to put on or take off ropes or skin. To negotiate these one must know how to go uphill on plain ski. Indeed, except for really long mountain tours, involving hours of climbing on difficult snow, it is not worth while using anything except the plain ski. Under normal conditions of snow the angle at which one can climb on plain ski is just a comfortable angle for uphill work. One is not called upon to imitate the ancient Romans, who felt bound to go straight over hill and dale ; one's pattern is rather that of the modern Norwegian,

whose characteristic, if we are to believe Ibsen, is to go round about.

There is yet another point which, on behalf of all users of glabrous ski, I should like to mention. It is that we feel in no way bound to stand about and wait whilst you, oh, hairy brother! adjust your scalp. It is no pleasure to us to see you stalking ahead afterwards in a track in which we are unable to follow.

Summary.—Use plain ski for all ordinary work, but for long mountain tours take the string arrangement described; it is at least harmless and may be useful.

WAX.

We have already referred to the disagreeable fact that in warm weather snow is apt to stick to the ski. The cure for this is the wax, either of the bee or of the candle, which is smeared and rubbed on to the parts likely to be affected. To do the work really thoroughly a hot flat iron and much wax is necessary; but let the reader beware of thoroughness! For if the running surfaces of the ski be waxed all over they will be found to be so slippery that it is impossible to get uphill on them at all. The best plan is to wax some portions only, and those which should receive the most liberal treatment are those parts which it is difficult to reach—that is to say, the heels. These for a length of a foot or so may be given a thorough waxing. Little dobs of wax may then be placed at intervals throughout the length to break up any big clods of snow which may accumulate, and another more liberal supply may be applied to the bends.

There are now all kinds of wax on the market made up in various degrees of solidity. The most useful kind is perhaps the semi-fluid sold in tubes. The advantage claimed for preparations of this kind is that they may be applied to the ski even when they are wet; but though this is partly true, it is always better to dry the ski as much as possible. A tube of one or other of these waxes comes in very handy on the top of a mountain, when there is no more climbing to be done. One can then wax the ski to one's heart's content, in the knowledge

that practically all the wax will wear off on the way down, and the ski will not be too slippery for the next day's climb.

In warm weather it is a good plan to wax the upper surface of the ski as well as the running surface, for snow is apt to

Photo by [*Will Cadby.*

WANTED, WAX!

stick there too, especially about the bend. This, of course, applies especially to ski which are painted black.

I know of only one thing which will remove wax if (as often happens) one should be troubled with too much of it, and that is the steel shavings which are used to polish floors.

Two good recipes for making a hard and a soft wax, for which

I am indebted to Dr. Wigner, of the Scottish Ski Club, are as under :—

Hard Wax : Beeswax 10 parts, resin 5 parts, oil of turpentine 1 part. Melt the wax and resin, stir in the turpentine, and cast in blocks.

Soft Wax : Beeswax or Japan wax 10 parts, resin 5 parts, oil of turpentine 20 parts, water 25 parts, soft soap 5 parts. Dissolve the soap in hot water, melt the wax and resin, and add the turpentine. Mix the two solutions and pour onto a slab, mix up with a spatula until moderately stiff, and load into collapsible tubes.

SCRAPER.

This is a most useful part of one's equipment, for even under the happiest of conditions snow clings to some extent to the boots and bindings, and requires clearing away when the ski are taken off and have to be put on again afterwards. Very fine, dry, powdery snow, as well as wet snow, is apt to stick to the running surfaces, but may usually be removed by a vigorous scrubbing backwards and forwards of the ski, on, say, the branch of a pine tree, but in obstinate cases the scraper comes in very handy.

Fig. 22.

For this purpose there is nothing to beat an oyster knife with a wooden handle, price 4½d., at any household cutler's. The point should be filed a little so as to fit into the groove of the ski (see Fig. 22).

REPAIRING OUTFIT.

It is well to be provided with a repairing outfit in case of accidents. Mine consists (see Fig. 23) of (1) a "tin toe" such as is sold in all the shops, (2) a strong gimlet, (3) a handy tool comprising a hammer, a small axe, a pair of pliers, and a screw-driver all in one ; (4) some small pieces of sheet brass with holes round the edges ; (5) some small screw and other nails ; (6) a long leather thong, spare straps, and string.

With these items and a little commonsense one should be able to patch up either ski or bindings whenever they may break. The commonest accident is to break the ski at the bend, and for this the "tin toe" is invaluable. Immediately after buying it punch small holes at each corner of the square end, on the upper surface. These are to permit of the passage of two small nails to hold the tin toe in place. The plan is better far than any clinching arrangement worked by keys, which, as the Irish-

Fig. 23. Repairing Outfit.

man said, are usually found to be lost when required. I have used, and seen the tin toe used, many a time in practice, and can vouch to the fact that it works very fairly well. The handy tool is, of course, rather a nuisance on account of its weight, but I find it so useful that I should be loth to do without it.

I once bought a beautiful little set of tools in a case. It consisted of a hammer, a screwdriver, a file, a gimlet, a saw, and a pricking sort of thing as to the use of which I am ignorant. All of these fitted beautifully into a knife. The first thing I used was

the gimlet, which broke at once. The hammer and the saw I found to be on too Liliputian a scale for my needs, and the knife refused to cut. The file may have been good enough, and so may have been the pricking thing, but they never got a chance of proving their merit, for a stiff screw caused inreparable damage to the catch into which they and the screwdriver fitted. Very likely it was all my fault, and with patience and careful handling all might have gone well; but when one's fingers are numbed with cold the touch is apt to be deficient in delicacy. I remember that at the time I sincerely hoped the maker of that tool would perish miserably on some lonely mountain-side, but I have since forgiven him, and now blame only myself for not having tested the apparatus before starting, a course which I recommend to all future purchasers.

It is quite unnecessary that every member of a touring party should be provided with a full repairing outfit. One, or at most two, sets should suffice, but there should be a fair division of the labour of carriage.

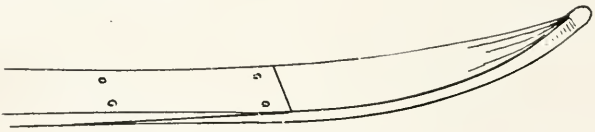

Fig. 24.

BROKEN SKI.

A ski broken at the bend should not be thrown away, but should be sent to the maker's to have a new point fitted to it. When properly repaired, as shown (Fig. 24), such a ski is as good as ever, and the new point only costs a few shillings.

Fig. 25.

THE RUCKSACK

(Fig. 25) should be capacious, but made of light material. Leather is too heavy. A couple of outside pockets are a great convenience for articles which are constantly

in use. The shoulder straps should be broad. Systematic people have all sorts of pockets and bags inside their rucksack, but this deprives them of the pleasurable experience of fishing, and of the surprises which await the careless. I once found a piece of cheese and a boiled egg—but the story has no bearing on the matter in hand.

BOOTS AND SOCKS.

The ski-runner cannot be too particular about his boots. They should be strong, waterproof, pliable, and large enough to contain the foot covered by an ordinary pair of thick socks, as well as a pair of the special ski socks known in Norway as "ladder." In default of either of these one may wear a pair of thick bed socks and even an extra pair or two of thick ordinary socks. The kind known in Norway as *raggesokker*, if they are, as they purport to be, really made of goat hair, are also admirable.

Special boots, *laupar sko* (see Fig. 26) are made for ski-ing. The disadvantage of these is that it is difficult to make the seams perfectly water-tight above the toes; and also that the leather, being of ordinary thickness just there, the toe-straps are somewhat liable to press into the boot and so to cause cold feet. On the other hand, the soft uppers permit of increased elasticity in the sole, which is said to be an advantage in case of a bad fall forward.

Fig. 26.

I have myself for the last few years used boots made in the ordinary way, of large size, with an extra stout leather toe-cap (see Fig. 27) and take my chance of the fall forward, which I do not think is rendered more dangerous by the sole being a little stiff. On the contrary, I think a slight degree of stiffness is some protection against spraining the toes. In any case, the soles should be fairly thick to stand the wear and tear of the binding and to prevent buckling; and plenty of room should be left for

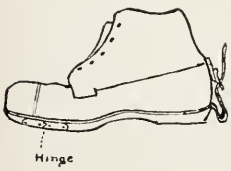

Fig. 27.

the toes to "waggle" about, a practice which, in very cold weather, may be resorted to to induce extra warmth. It is important that *the fit round the instep and ankle should be quite perfect, or sore heels may result.* A perfect fit does not, of course, imply tightness.

A small strap and buckle (see Fig. 27) should be sewn on to the heel of the boot, if either Huitfeldt's or Ellefsen's binding is to be used. This is to hold the heel-strap in place, and is also very useful as a sort of shoehorn to help one to put the binding on.

The soles of the boots are apt to wear just where they are gripped by the iron toe-pieces of the binding. To overcome this, one may fix a small piece of metal to the soles where the wear and tear comes. The objection to this is that it is apt to make the soles rather too stiff, and also that it is difficult to fix the metal so that it does not come off. I have found a little hinge in the iron as shown Fig. 27 to be useful, and to allow of more flexibility. Another plan is to have removable leather pads between the toe irons and the sole of the boot. These may be obtained commercially.

Personally, I like a few nails, so-called ladies' nails, in the soles. They are a great comfort near the habitations of man around which there is always ice, and also on mountain tours for scrambling up a pass or the last few yards of a mountain top.

A piece of thick felt fixed in front of the binding and held over the toes by the toe-strap is very useful to keep the toes warm.

Foot-gear of this kind will be found warm enough for all ordinary purposes, but in a real blizzard there is nothing to beat an old pair of socks put on outside one's boots.

Castor oil is an admirable unguent for boots, and may be applied freely to a new pair. It is, however, said to be a mistake to use too much oil, as to do so induces cold feet, and in deference to this belief I oil my boots at the beginning and end of the season only. Would that all superstitions demanded so little of one!

GLOVES.

Most of the gloves on the market serve their purpose very imperfectly, so I will not take up the reader's time with them.

The proper plan is certainly to clothe the hands on the same principle as one clothes the feet—that is to say, with an inner and an outer covering. The inner covering should consist of a glove with the usual thumb, but without separate divisions for the fingers. It should be made of some warm, woolly material, and may reach a little above the wrists. The so-called "doddie" sold in Scotland is admirable. The outer covering may be made of canvas or of some other strong material—*e.g.*, the mixture of canvas and rubber used for patching motor tyres, which an ingenious lady member of the Scottish Ski Club has pressed into service. The outer covering should also be made on the thumb and bag-for-the-fingers plan, but should reach well above the end of the sleeve of the coat. Its open end should be furnished with a catch of some kind, so that it may be shut close to the sleeve to prevent the entrance of snow. Care should be taken to make the outer covering extra strong between the thumb and forefinger, as it is there that the wear and tear caused by holding the stick comes.

Fig. 28 shows a good pattern for the outer covering, which, if not procurable elsewhere, can easily be made at home. Two pieces of canvas may be cut out in this shape and hemmed strongly together.

Fig. 28.

The advantage of this plan of clothing the hands is that it ensures dryness and warmth. In warm, sunny weather, when there is no likelihood of a fall, one does not wear any gloves, or if it grows a little cold one puts on the outer coverings alone, leaving the tops loose to ensure ventilation; if, however, it grows colder still, or if there is any risk of a fall, one shuts up the tops, and in really cold weather one puts on the woolly inner covering which may thus always be kept dry. The trouble with ordinary woolly gloves without any waterproof covering is, that either from perspiration or contact with the snow they are apt to become wet, in which condition they are both a source of discomfort, and, in case the weather should grow cold, of danger from frost-bite.

HEADGEAR.

For men a light cap with a flap round the edge, which may be folded down over the tops of the ears is useful (Fig. 29).

This is sufficient protection in all but the coldest weather, when it may be supplemented with a scarf tied round the head. A useful way of folding the scarf is as follows: Spread a handkerchief out and fold the top side of it over to the depth of about nine inches (see 1, Fig. 30). Next, *turn the handkerchief right over* and fold the top side as shown (2); then roll up the bottom side, as shown in (3). This forms a sort of hood (4), with ends which may be tied under the chin.

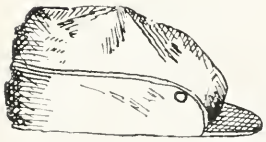

Fig. 29.

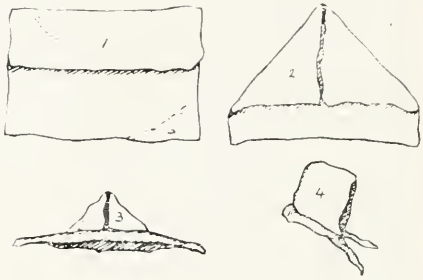

Fig. 30.
Method of folding scarf to make hood.

Ladies may be left to work out something for themselves on similar lines. The principle to be borne in mind is that the cap should, for ordinary purposes, be light, but that it should be capable on occasion of affording proper protection to the ears and the back of the neck.

OTHER CLOTHING.

Provided that the coat and trousers are made of some closely woven material to prevent wind penetrating, there is little fear of any part of the body except the extremities being too cold. The rest of the clothing may therefore be of almost summer lightness.

For men I recommend light flannel drawers and undervest, flannel shirt, warm, woolly waistcoat, double-breasted coat, and

ordinary trousers. The coat and trousers should be made of light, *smooth* stuff, which, though close, should also be porous. Rough material is to be avoided above all things, for the snow sticks to it after a fall, and melts, and generally adds both to one's discomfiture and discomfort. The sleeves and collar of the coat should be made so that they may be worn either loose or

Photo by] [*H Hoek.*

A Black Forest Lady.

buttoned over to fit closely. The pockets should be capacious, and should also have flaps which can be buttoned down. Some of them may with advantage be lined with waterproof.

The trousers must be closed over the boots to prevent the entrance of snow. This may be effected by a strap and buckle or button, or a short puttee, or even by an ordinary bicycle clip.

In Central Europe a close-fitting tunic and trousers made of

some dark material, such as was once the thing in Norway, are at present much in vogue. In Norway, however, this is no longer considered *chic*. The proper thing there is the garb which English people frequently affect, viz., shooting-cap, Norfolk jacket, breeches, and puttees. Every man to his taste, but very dark cloth is apt to be hot in the sun and is no warmer than light-coloured cloth in the shade.

For ladies the only real solution of the problem is a tailor-made coat and knickerbockers, which latter should not be cut too full. In German and Austrian centres this attire is now so common as to attract no attention ; but in Switzerland only the brave and in Norway only the heroic dare to appear in it. A light, short skirt should be added for these countries. Puttees are perhaps the best form of legging, and are much worn by ladies everywhere.

A useful addition to the wardrobe of both sexes, especially for the Norwegian *fjaelds*, is a windproof coat and hood made of very light oiled silk. It should not weigh more than a few ounces, and could easily be made by any tailor. A light warm sweater to slip on at lunch time is also serviceable.

GOGGLES, ETC.

Some protection for the eyes against snow-blindness is essential. The trouble with goggles, however, is that they are apt to become dimmed with perspiration. For some years past I have used nothing but the simple appliance shown in Fig. 31, which I have found to afford ample protection everywhere.

Fig. 31.

It is made of a bit of old shoe leather and a piece of string. A notch is cut for the nose and then an oval shaped hole opposite each eye. The holes need by no means be so very small, about half an inch long by three-eighths of an inch broad affords a great deal of protection.

Some people seem to be much more liable to snow-blindness than others, and it would seem that dark-eyed people are more so than light. This is remarkable, for the complaint does not seem

to attack the iris of the eye. In the early part of the year it is seldom necessary to take any precautions, but in February and March one must be on one's guard. On the windy *fjaelds* of Norway and Sweden the risk is greater than in Switzerland. Bright cloudy days are perhaps more dangerous than sunny days.

VARIOUS ODDS AND ENDS.

A Water Bottle of some kind containing what one pleases. Plain sugar and water is perhaps an acquired taste, but it is very refreshing, for sugar is a valuable food, and a solution of it is taken up very quickly by the system.

Awful warnings are uttered against drinking alcohol and eating snow, but I have friends who do both in moderation, and who never seem any the worse—and, yes, I will confess it, I myself like a little tot of something after lunch ; it keeps one warm until the exercise has of itself restored the circulation. If one were going to spend a night out in the snow, or if one were going to climb Mont Blanc, I suppose it would be better to avoid alcohol entirely ; but surely there is no need to take an ordinary ski tour so *very* seriously.

The " Thermos " flask, filled with hot chocolate, is a pleasant but rather a heavy companion.

Food.—For expeditions to club huts there is nothing to beat the pea, or lentil soup, made up in a dry state in sausages. Cocoa is also nourishing and easily made. Fat bacon does not sound inviting to the pampered town-dweller, but it is very good after a long day, and goes well with the pea-soup. Other provisions require no special mention, but should, like the lunch one carries for an ordinary day's tour, include a few delicacies as well as the staple food which one prefers. Apples and oranges are always acceptable, and at lunch time go very well *with* sandwiches.

A Pocket Compass should be carried. To steady it, wrap copper wire three or four times round the case, crossing the face east and west ; then join up the ends. In a fog the last man of the party should carry the compass and shout directions to the leader. It is thus easy to keep in a straight line.

Excellent Maps are published of the Alps, but the Norwegian

surveys are by no means so good. They are, however, accurate enough for most purposes.

A LANTERN of some kind is useful for touring in out-of-the-way places where one *may* have to spend a night in the open. The best kind is that known as the collapsible "Excelsior Lux" of the Italian Alpine Club.

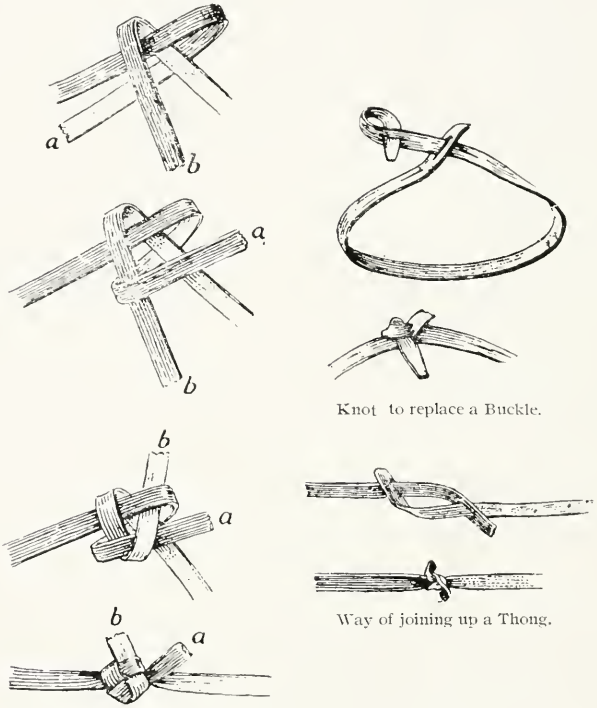

Fig. 32.

KNOTS, LASHINGS, ETC.—The knots shown in Fig. 32 will be found useful for leather thongs, broken straps, etc.

BAMBOO STICKS which have split may be temporarily repaired by wrapping the adhesive plaster, sold by chemists, in long rolls round and round them; but should afterwards be bound round with waxed string, after the manner of a cricket bat. A

coat of paint over the string is desirable. The art of waxing string is as follows :—Place a small ball of cobbler's wax in a piece of old shoe leather. Tie one end of the string to the handle of the door, and then, beginning near the handle and holding the string taut with one hand, rub the wax *lightly and rapidly* backwards and forwards till the whole length is thinly coated. The heat generated by the friction partially melts the wax, which allows it to slide backwards and forwards easily so long as one does not stop the movement. A pair of old gloves will prevent the fingers getting soiled when the wrapping is being put on, or if this should happen, vaseline, turpentine, petrol, or methylated spirits, will remove the trouble.

Fig. 33.

A Sling for carrying the ski is required when rocks have to be climbed. It is not necessary for ordinary ski tours.

On steep, icy paths it is often easier to tow the ski than to carry them, to which end a couple of holes bored in the points and a piece of cord (that mentioned on p. 85) will effect the purpose. A useful way of carrying the ski is shown in Fig. 33.

Note.—The following articles may be regarded as special ski-ing necessities :—Ski, with bindings and foot-plates, sticks, and proper boots, socks, and gloves. These are things which will be wanted from the very first, and to the good quality of which too much attention cannot be paid.

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Running, Turning &c.

Under this heading there is included advice and instruction in all that relates to the management of the ski on the level, uphill, downhill. What is written is, of course, principally intended for beginners, who, it is assumed, know nothing about the sport ; but it also contains matter which, it is hoped, may interest and help those who have already made *some* progress. In order, therefore, that the beginner may not be confused by details with which he is not immediately concerned, I have added further on a chapter recommending a course of practice, from which he will be able to see what those matters are to which he should first of all devote his attention. He may therefore begin by rapidly glancing through the following pages, and then proceed to the chapter specially dedicated to him, referring back as may be required.

Turning on the Spot.

or the "kick" turn, may be learnt in a few minutes on the lawn at home.

(1) Raise the point of, say the right ski, at the same time advancing the heel. (2) Swing the right ski round and place it alongside the left, so that the two ski point in opposite directions (this is the only difficulty in the manœuvre).

(3) *Raise the point* of the left ski, *keeping the heel down*, and swing the ski right round till it lies alongside the right (see Fig. 34).

On the level this is all very easy, but on a steep hillside it is a good deal more troublesome. There, too, the question arises whether the upper or lower ski should be moved first. The answer is to turn the upper ski first for the reason that by so doing a step is gained instead of lost. This may not be, indeed is not, of vast importance; but in the course of a steep climb the little distances gained by turning the upper ski first soon become worth considering. On a longish tour I once tried to count how many times we turned like this, but after about fifty something occurred to attract my attention, and I have never had the patience to repeat the experiment. But even in fifty times the difference between the right way and the wrong amounts to quite a respectable height.

Fig. 34.

Another argument in favour of turning the upper foot first is that one faces the hill throughout the entire manœuvre, an undoubted advantage to those who, on very long, steep slopes, may be addicted to giddiness.

It has been said that on very steep slopes one cannot turn in this way, to which I can only reply that I can and do. It has also been said to be safer to turn the lower ski first, but I think not, as then one has no friendly track below which may help to stop a slip. It is perhaps just a little more difficult to turn the upper ski first, but not much. The secret in so doing is to lift the toe and depress the heel of the lower ski before attempting to swing it round. One will of course begin by making the turn deliberately and slowly, but a good ski-runner on a moderate slope does not require to stop at all; his ski move as shown in Fig. 35.

Fig. 35.

On the Level.

Level-running on ski resembles neither walking nor skating. It is rather to be compared with sliding. Lunge forward on one

Photo by] [*E. C. R.*

ON THE LEVEL.

foot and slide on both, keeping the weight well on the front ski; then, *whilst still moving*, bring the other foot forward in the same way and lunge and slide on it.

When moving very fast, as in racing, the ski may be lifted a little off the ground at each step, much as in ordinary running, but as a rule the ski are not lifted from the ground at all.

The impetus is gained by throwing the weight of the body forward and a little sideways on to each foot alternately. The consequence of this action is that a good runner sways somewhat from side to side at each step. The difficulty the beginner will experience will be the sliding on one foot, for though the other foot is also on the ground it really assists the balance very little. He should not attempt to take too long steps, but rather endeavour to slide as far as possible. The knee of the foot on which he slides should be bent, and the top of his chest should be well over the bent knee (see Fig. 36).

Fig. 36.

The track should be as narrow as possible, so narrow that the ankles just clear one another at every step.

The sticks should be used for pushing and so lengthening the slide, and not for aiding the balance. When moving slowly one gives a push with each arm alternately, but when the ski are sliding well, one pushes with both arms at once every two or three steps. It is just as well to preserve a rhythm in doing this; a useful one which changes the foot on which the long slide is made is—Left, right, left, long slide and push; right, left, right, long slide and push, etc.

The speed on the level depends very largely on the state of the snow. On the hard snow of a road, for instance, one slides very easily, and with two sticks to help four or five miles an hour is quite a comfortable pace and is much easier than walking; but in deep, soft snow the speed is much slower. Ordinary walking speed may perhaps be taken as the average.

To give some idea of what *can* be done on the level, the two following racing records are appended:—

At the Nordenskjöld Races in Sweden, in April, '84, the winner, a Lapp named Tuorda, covered 220 kilometres (nearly 140 miles) in 21 hours 22 minutes. In 1901, A. Autis, a Finn, covered 30 kilometres in 1 hour 46 minutes.

The courses in these races lay over practically level ground.

Uphill.

So long as the incline is but slight one proceeds just as on the level ; but as the hill grows steeper there soon comes a point when the ski begin to slip backwards, and it becomes necessary to adopt the following device :—

Fig. 37.

Raise the point of the ski (not the heel) two or three inches, and bring it down again with a brisk slap on the snow (see Fig. 37). This causes the running surface to stick just a little more than if it were pushed forward, and enables one to climb more steeply than before. The movement is easy enough, but at first it calls for the exercise of attention. The secret is to slap the ski down just as if one intended to nail it to the spot ; *on no account must it be pulled back.* The weight of the body should then be placed perpendicularly over it at once—that is to say, there must be no attempt to haul oneself uphill by the sticking ski.

The angle at which one can climb in this way depends a good deal on one's skill, and also to some extent on the slipperiness of the snow, which varies from day to day. It is best at first to be content with a moderate degree of steepness, as there is nothing more tiring than slipping back. One soon learns by experience just what angle can be managed. Beginners usually try to climb too steeply, and I have often seen them stamping, struggling, slipping, falling, and exhausting themselves in attempting the impossible. Should you ever get into such a plight, remember that if the ski are edged into the snow on the slide of the hill, and if they point at right angles to the slope of the hill,

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ON A CORNICED RIDGE. [*Photo by E. C. R.*

they cannot slip. Thus, if this page represents the side of a hill, ski which are placed like this // will slip; whereas, if they are placed like this = they will not. As soon, therefore, as you begin to slip about, get the ski at right angles to the slope of the hill as quickly as you can, and then start off afresh at an angle which is less ambitious. Long, steep slopes are climbed as shown in Fig. 38. Make the upward track at a convenient gradient, and turn at the corners, moving the upper ski first, as previously recommended.

Fig. 38.

Fig. 39 shows another way of going uphill known as side-stepping. Side-stepping straight up like this is, however, very tiring, and should only be resorted to when other methods are out of the question. The variation of it, however, shown in Fig. 40, in which one advances at the same time as one steps sideways, and in which the ski are pointed a little uphill, is not nearly so fatiguing, and may be kept up for long distances. It is particularly useful and labour saving on hard snow.

Photo by [*H. Hoek.*

Fig. 39.—Side-Stepping.

Photo by] [*E. C. R.*

Fig. 40.—Half-Side-Stepping.

When side-stepping, care should be taken to *raise the heel of the upper ski* clear of the ground, and to place it well uphill. This is both to prevent slipping and also to prevent the heel of the lower ski crossing it at the next step and so hindering further advance. Beginners invariably fail to take this simple but necessary precaution. The correct method is shown in Fig. 41.

Fig. 41.—Placing the Heel Uphill.

Steep bits of narrowish road, etc., may be negotiated by side-stepping *backwards* as well as forwards (see Fig. 42). This is also less fatiguing than plain side-stepping. Be careful when the step backwards is taken to place the heel of the upper ski

further uphill than the point. "Herring-boning" (Fig. 43) is useful for short stretches, but tiring.

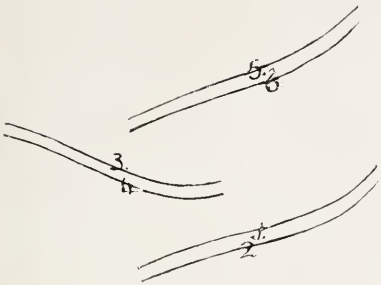

Fig. 42.

"Half-Herring-boning," as it may perhaps be termed (Fig. 44), is often serviceable when one requires to go just a little extra steeply straight uphill. Turn the ski on their inside edges for this, and walk with the toes pointing a little outwards, knock-kneed, with the feet apart —like the hind legs of a cow.

Uphill the management of the sticks calls for little comment. It is only to be observed that on *very* steep slopes they should be held together like a single stick across the body, with their points directed towards the slope, in which position they are most serviceable in case of a slip.

Photo by] [*H Hoek.*

Fig. 43.—HERRING-BONING.

Walking uphill on ski is as a rule about 25 per cent. slower than walking uphill on foot, about 1,000 feet per hour (measuring, of course, the vertical distance only) being a good, steady pace for most people. Like all uphill work, it is more or less fatiguing, though its labours may be much reduced by good and intelligent technique. The making of a suitable track which mounts upwards just so steeply (but no steeper) than the weakest member of the party can climb, which involves as few tacks as possible, and in the course of which the easiest snow on the mountain-side is traversed, is in itself an art. One should aim at advancing at a good, steady pace, and the party, except on very steep slopes where there may be a danger of avalanches, should keep together — not indeed so close together as to tread on the backs of each other's ski, but so close that no one should have the feeling of being left behind.

Photo by] *[H Hoek.*

Fig 44.—Half Herring-boning.

A curious thing about uphill work on ski is the way in which it affects the temper of some. There are men who in the valley are so mild-tempered that if you happen to tread on a pet corn they would hasten to put you at your ease with assurances that it was nothing, who, nevertheless, on the mountain-side, should you happen to touch the backs of their ski, will grow furiously angry and deaf to your humblest apologies.

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RUNNING DOWN [*Photo by E.C.R.*

On every ski-tour, too, there are those who know better than the leader of the party which is the best way up, and whose grievance finds utterance in some more or less objectionable form. The leader of the party, on the other hand, is apt to be dictatorial and domineering when going uphill, and to make a fuss about little divergencies from the track, and other trifles which are really of no moment whatsoever. Fortunately, however, as soon as the run down begins, all those things are forgotten and forgiven. It is, indeed, remarkable what heat and what cold, what sweating and what shivering, what struggling on icy slopes and what plodding through sticky snow, a good run down atones for. At the end of the day all these things seem but memories of a distant past, uneventful and tame in comparison to what one has just come through.

Photo by] [*E. C. R.*

UPHILL.

Straight-Running Downhill.

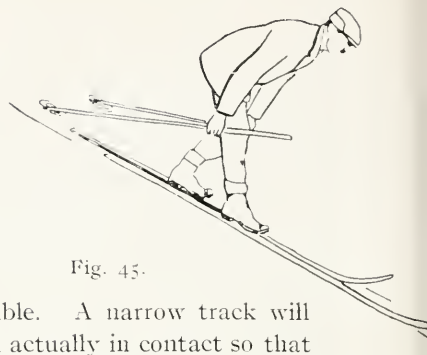

Fig. 45.

The normal position for straight-running is that shown in Fig. 45.

One or other foot (in the diagram the right) *is advanced two or three inches in front of the other and the ski are held closely together*, touching if possible. A narrow track will be ensured if the knees are held actually in contact so that the knee-cap of the one fits in the little hollow beside the knee-cap of the other. The knees, especially the back knee, should be somewhat bent, as shown, and their joints and those of other parts of the body should be, like the springs of a well-

Photo by] [*E. C. R.*

DOWNHILL. A NARROW TRACK.

hung carriage, resilient, but firm. There should be no stiffness anywhere, but every part should be ready to adjust itself to and assist the balance of the whole.

When one *starts off* on a run down, the weight of the body should be thrown well forward onto the ball of the front foot,

Photo by] [*E. C. R.*

BEGINNERS AND THEIR WIDE TRACKS.

to counteract the tendency to fall backwards, caused by the ski moving before the upper part of the body has started; but once full momentum is gained *the weight should rest mainly on the ball of the foot which is behind.*

This is the normal position for straight-running, and one in which the balance of the body is best placed to cope with the ups and downs of the ground. The foot which is in front bears only a

small portion of the weight unless a rise in the ground is encountered, in which case it feels the first of the rise and warns the runner to lean back a little. In the case of a dip, too, it gives notice of what is coming, and warns the runner to lean forward a little more to prevent the ski bolting from under him. One should be able to run with either foot leading.

The position with the feet close together is one which will trouble the beginner a good deal, but he should nevertheless practice it assiduously from the first.

The track which, under normal conditions, the ski make in the snow downhill should not be two lines, but one line only. This is not merely for the sake of appearances, though, of course, the single track looks far better; but for the sake of balance, for once the knack is learnt it is far easier to run with the feet close together than wide apart. I am not quite sure why this should be, but hazard the conjecture that the nearer the supporting surface approaches to a knife edge, the less likely is it to be affected by small lateral inequalities of the ground.

There is, however, no rule without its exception, and the exception to the security of the narrow track is when the ski themselves tend to slip sideways. This happens on icy *roads, hard snow, steep hillsides, etc.*, and in such places *it becomes necessary to run with the ski level and a little apart*, and to balance the weight evenly between the two feet, a position which, however, is much less stable than that mentioned above. The tendency for the ski to slip sideways is, of course, increased if they are short and if they have no grooves in their running surfaces. The wearers of such ski are, consequently, almost driven to run with the legs apart, and to compensate for their lack of balance by running slowly and by an undue use of the stick.

The beginner is certain to experience more or less difficulty in starting his run-down from a stationary position at right angles to the slope of the hill. On moderate slopes he may, of course, support himself facing downhill, ready to start, on the two sticks, but as on very steep slopes this is out of the question, and as it is just on very steep slopes that starting is most difficult, it is better

to get into the habit of starting off without this assistance. The proper plan is to step round, moving, of course, the lower ski first, and the only advice to be given is to lean well forward and to be as quick about it as possible. The ski do not gain impetus at once, and if the steps are taken quickly one gets into the right direction before much speed is gained.

When the snow is fast in some places and slow in others, it is well to bend well down, so as to minimise the risk of being thrown forward when the speed is suddenly checked. And

Photo by] [*E. C. R.*

RUNNING DOWN.

there are, of course, numerous other little alterations in position which the runner will find out for himself, for whilst the position shown in Fig. 45 is the normal position and one which the beginner should study, it is not by that implied that he should slavishly adhere to it on all occasions and in every respect.

The correct way of holding the sticks when running downhill, when there is no likelihood of their being required as a brake, is to hold one in each hand, as shown in Fig. 45. When, however, they are required in that capacity, they should be held together in both hands across the body. Never hold the sticks by their

middles, or in front of the body when running fast downhill, for if you do it is by no means improbable that one day or other you will fall upon one of them and seriously injure yourself.

Fig. 46 shows a very bad but not uncommon attitude.

The great secret in running downhill is to be courageous, to determine not to fall, and not to worry about little obstacles. The running surfaces of the ski are long, and if the bends are properly constructed it is surprising how little the equilibrium is upset even by fairly large obstacles. The ski tracks of others, and even the holes made by their falls, need cause no anxiety.

The beginner falls, nine times out of ten, not because his balance is upset, but because he loses his head and imagines dreadful things are going to happen to him. The speed at first, though probably quite moderate, appears terrific, and the long slope below, seeming as it does to invite a header, causes him almost instinctively to lean too much backwards. For this reason the excellent advice has been reiterated to "lean forward," as though trying to increase the speed, and though the best position is not really with the weight in advance, the novice may well try to counteract his tendency to fall backwards by taking the maxim to heart.

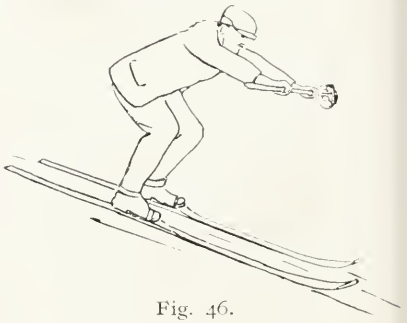

Fig. 46.

The beginner should try to run straight over rather than round little ups and downs in his course, and should practice standing down all the short, steep hills he can find. In so doing he will have many a fall, and may perhaps incur the ridicule of some who pride themselves on never falling. But let him not trouble about that, for those who are always running round and shirking difficulties, though they may seldom fall, will never attain to any great skill in the sport.

At the time of writing this idea of the best runner being he who falls least is, unfortunately, somewhat rife amongst Englishmen,

and the story goes that in an hotel at a well-known winter resort, the following conversation took place :—

Brown : " How did you get on to-day ? "
Jones : " Not very well. I had four falls."
Brown : " Ah ! I did better than that : I had only one fall and a sit down ! "

Now, without entering into this classification of tumbles, it is evident that had these men been first-rate Norwegian runners careering across country, or vieing with one another in 30-metre jumps, there might have been some point in their comparing the number of their falls ; but in the case of Brown and Jones all that the conversation meant was that, whilst both had spent the afternoon crawling slowly downhill, avoiding any difficulty which lay in the way, Brown had crawled a little more cautiously than Jones. Had they covered the running surfaces of their ski with skin, taking care that the hairs pointed forwards, it is probable that neither would have fallen at all !

The difficulty in ski-ing consists neither in unqualified straight-running nor in unqualified turning, but in fast straight-running, and in fast turning.

Nor is it in any way to the point to urge that Brown, who habitually goes slowly, beat Robinson last year in a race, all because Robinson took risks and fell. The tortoise is not really a fleeter animal than the hare, and the day will come when Robinson will run fast and *not* fall ; whereas Brown, unless he mends his ways, will always remain a crawler.

What speed is attained downhill on ski ? Off-hand, one would say 80 or 90 miles per hour on a very steep hill, or over a big jump ; but a mathematical friend assures me that owing to wind pressure this is out of the question. For a 12-stone man, presenting a surface of four square feet, to attain this speed, the angle of the slope would have to be about 62 degrees, and if the man weighed only 10½ stone, and had the same surface, he would have to fall almost vertically ! Here, then, we have the limit to speed on ski sharply defined.

Falling, Getting Up, Accidents, etc.

The simplest way of stopping, and one which the reader will adopt most frequently at first, is to fall. But let it not be supposed that because falling is included under the heading of stopping, that it is a method to be regularly resorted to. There are, however, times when one is almost forced to fall, and a word on the subject may not be amiss.

The safest way to fall is to relax every muscle in the body and just let oneself go, roly-poly, helter-skelter, every way. So long as all the muscles are relaxed, it is very improbable that anything will be injured. Of course, if one does get a chance of raising the ski in the air, and keeping them there, one should avail oneself of it, as the only risk is that of the ski catching in the snow and so causing damage ; but it is improbable that such an opportunity will present itself if one is going fast.

Contrary to what might at first be supposed, it is more dangerous to fall on very soft snow than on comparatively hard. For on firm snow the ski are not nearly so likely to be held up. On a well-trodden jumping hill, for instance, the risk is very slight, as may be gathered from the very few accidents which take place there, even on falling after jumps of 100 feet and over.

On soft snow, on the other hand, accidents occur more frequently, and sometimes even when the runner is moving quite slowly.

Hence, though I am unwilling to fill this book with awful warnings against dangers, and though recklessness as regards falling is not at present a characteristic of most English runners, I would ask that a little discrimination be employed, that on soft snow more caution be exercised, and on firm snow more daring.

When treating of this subject of accidents, too, it is well to reiterate what was mentioned above concerning the danger of thrusting the toe of the boot too far between the toe-pieces of the binding. The practice is a most dangerous one, and is responsible, I believe, for more than half the number of accidents which occur.

Getting up after a fall will not present much difficulty to the young and active, though the elderly and stout sometimes find it troublesome. On a steep slope it is clear that there can be no prospect of getting up so long as the head is nearer the valley than the feet, yet not everybody seems to realize that this is so. The procedure on such occasions is akin to that advocated by the White Knight for getting over gates ; for the difficulty, as pointed out by that philosopher, is not with the head, which is already well placed, but with the feet. The first thing, therefore, to be done is to get the feet below one with the ski at right angles to the slope of the hill, after which all is easy. On the level, trouble is sometimes caused by the body of the patient remaining in the hole occasioned by his fall, whilst his ski are at a higher level. The plan then is to struggle on to the backs of the ski and sit there ; whence, after a moment's pause, one can usually rise without much difficulty.

Braking and Stopping with the Sticks.

The important thing to be remembered is that the position assumed for this should be such that the balance is not disturbed. Fig. 47 shows a wrong position, which is unfortunately a common one.

Fig. 47.—Wrong.

Fig. 48.—Right.

The runner has really lost his balance, and will hardly be able to recover himself. It is, moreover, to be noted that his sticks, being placed at an acute angle to the snow, are by no means acting with complete efficiency as a brake.

The correct way of braking is to hold the sticks together,

and to keep them as far forward and as upright as possible; so long, indeed, as the sticks are not allowed to drag behind, it does not matter much how one applies them to the snow. Fig. 48, however, shows a way which is specially useful. The lower arm, which holds the sticks, is supported against one of the thighs, and the stick rests against the shins. The upper arm is held high up. Leverage is thus obtained, and the stick prevented from dragging behind.

Braking with the stick is, of course, far more efficacious when accompanied by braking with the ski themselves, of which more anon.

Slight Changes in Direction

are effected by leaning a little in the direction required, a fact which calls for no explanation.

Skating

is also almost self-explanatory. One simply lifts one of the ski from the ground and places it in the direction in which one wishes to go, at the same turn striking off with the other. The manœuvre can be used on the level to increase the speed, though there it is too tiring to be sustained for long, and also it may be used when glissading, to alter the direction in which one is moving.

For this latter purpose it is very useful, but when moving fast by no means easy. It is chiefly serviceable for avoiding obstacles, such as stones, trees, etc., which are in the way, and also for turning corners on roads. The advantage of skating as a method of changing one's direction is that it does not retard the speed, but, on the contrary, somewhat accelerates it. It is, indeed, a fine sight to see a good runner sliding fast through a thick-set forest and avoiding the trees by striking off now in this direction, now in that.

A beginner once asked me how I turned the corners of a certain Alpine road. He had, he said, been trying to do so by using Telemark and Christiania swings, but had failed. I replied that I just stepped round them, and showed him how to do so. "Oh," he said, "is that allowable? I thought it was bad style to raise

the ski from the ground." I besought him not to bother his head about style, whereupon he tried my way and at once succeeded admirably.

The Snow-plough.

Straddle the legs as widely apart, and turn the toes inward as much as possible. The position will then be that shown in

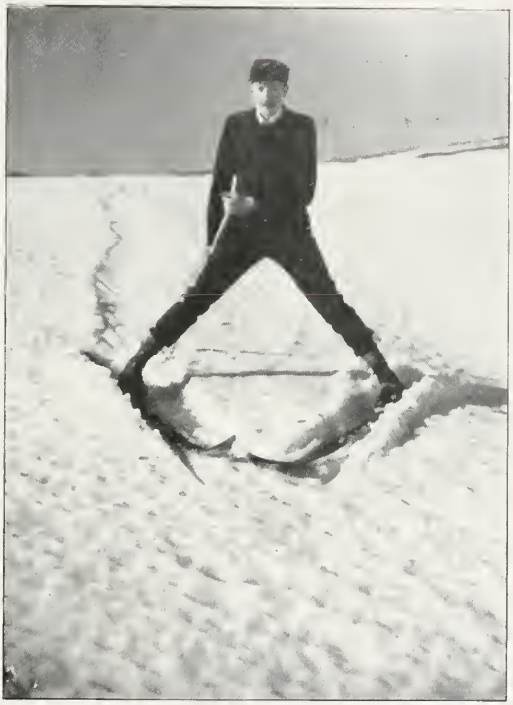

Photo by [*H. Hoek.*

Fig. 49.—Snow-Ploughing.

Fig. 49. This is the most useful of all the methods of braking, stopping, and turning.

In principle, it is perfectly simple, and consists in forcing the ski half sideways, instead of end on, through the snow.

The difficulty most beginners experience is in straddling sufficiently. But this will soon be learnt, especially if one practices the position for a minute or two every morning and evening before dressing and going to bed.

There is, of course, always a tendency for the ski to run in the direction in which they are pointing instead of sideways, and to cross each other in front, and so to occasion a fall forwards.

Snow-ploughing is, consequently, easiest on hard snow—*e.g.*, on a road—for there the ski are on the top of the snow and slip sideways easily ; and it is most difficult in deep snow, where the ski are buried, for there the whole area of their sides offers resistance to side-slipping. The tendency for the ski to cross in front also increases with the speed at which one is travelling, and, consequently, the less the speed the easier it is to brake with the snow plough. The method, indeed, is not practicable when moving at all fast on unbroken snow, where it becomes necessary first to reduce the pace in other ways before resorting to it.

To practice the snow-plough proceed to the top of a moderate incline, where the snow is not too soft ; if it has been beaten down somewhat, as, *e.g.*, on a road, so much the better. Start running down in the normal position, and immediately straddle the legs wide apart. If the speed has become too great, it may be checked with the stick till it amounts to about an ordinary walking pace. Then turn the toes well in and try to regulate the speed with the ski alone, without using the stick. Practice descending the hill slowly but steadily in this way, leaving behind a broad, wide track, as shown in the photograph. It will be found that if the snow is hard and slippery the speed can best be regulated by turning the ski somewhat on their edges ; but that if the snow is comparatively soft it is better to keep the ski rather flat.

I am particularly anxious that the beginner should become proficient in this exercise, as, if he does, he will find it far easier to learn what is to follow, viz., stemming, the downhill turn, and the Telemark swing.

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DOWNHILL TURN TO LEFT AND RIGHT. [*Photos by H. Hoek.*

Stemming.

When practicing the last exercise, the runner will almost certainly have discovered how to stem. He will, when proceeding downhill, as shown in Fig. 49, have found out that if he places the weight on, say, the left ski, he will turn off to the right, and contrariwise—that if he places the weight on the right ski he will turn off to the left.

Photo by] [*H. Hoek.*

Fig. 50.—Stemming.

To "stem," all that he has to do is to continue his course in the direction and position in which, in one or other of these cases, he finds himself.

He will, however, now find it convenient to place most of his weight on the upper ski and to hold the lower ski in position, mainly by muscular effort (see Fig. 50).

Stemming is, in fact, a sort of half snow-ploughing, and consists in running straight on one ski and at the same time turning the heel of the other outwards and downwards, and braking with

it. It is useful chiefly on steep slopes for braking and steering, and also for stopping by turning uphill.

To practice stemming, choose a good steep slope, and start across it with the feet just a little apart and the points of the ski either level or with one a little in front of the other (it really matters not which). Now try reducing the speed by braking a little with the stick, and at the same time thrusting the heel of the lower ski outwards. The result will be that you will turn uphill and come to a standstill.

If, however, at the same time as the heel of the *lower* ski is pressed outwards the heel of the *upper* ski is pressed in the opposite direction, you will be able either to continue in a straight line or to turn more downhill. This is, in fact, nothing more than snow-ploughing when crossing a hillside, and will, if snow-ploughing straight downhill has previously been practiced, appear quite easy.

As soon as you have gained some skill in regulating your movements when moving at a slow rate of speed, crossing the hill at a moderate angle, try to go both steeper and faster. Try also to control the speed, and steer as much as possible with the ski themselves rather than with the sticks, and do not forget to hold the points of these implements well in front of you on the side nearest to the slope of the hill.

Side-Slipping.

On steep slopes which, for one reason or other, cannot be taken straight, it will often be found convenient to slip down sideways. This is accomplished by turning the ski flat on the snow from the ordinary edged position. Thus, if from the position AA (Fig. 51) the ski are turned to the position BB, the runner will begin to slip sideways in the direction of the arrow. This manœuvre can obviously be accomplished either when moving or from rest.

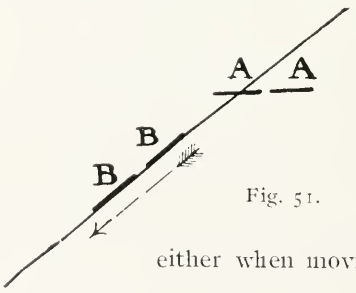

Fig. 51.

From rest it is useful only on *very* steep slopes, where space is not available for getting down in any other way. The sticks will be found of great assistance for side-slipping from rest, both in starting off and in regulating the balance and the speed.

Side-slipping when at the same time moving forwards is also a most useful accomplishment ; it is perhaps a little more difficult than stemming, for in it the ski are held closely together. The balance may, however, at first be aided by the use of the sticks just as in stemming. Side-slipping is much less tiring than stemming, for the reason that the braking is effected by the weight of the body only and not by the constrained action of holding out the heel of one of the ski. A good runner very seldom resorts to stemming except as a preparation for the downhill turn, of which more anon.

The Christiania Swing with the Stick.

When stemming or side-slipping in the manner described above, my pupil will almost certainly have discovered that if he presses round *both* of his heels at once, and, at the same time, digs his sticks into the snow above him, he will turn sharply uphill and come to a standstill. This is the "Christiania swing" with the stick, and is a very easy and useful method of stopping. It may, of course, also be performed on level ground.

The Christiania swing *without* the stick is a good deal more difficult, and as it is not, strictly speaking, a necessity, its consideration will be deferred to a subsequent section.

The reader, if he has followed the course of instruction recommended, is now in a position to make long tours and to cross the most difficult ground. If, for instance, he comes to a very steep and dangerous slope which he cannot negotiate "straight," all he has to do is to descend it in a zig-zag line, steering amongst the obstacles by means of snow-ploughing, stemming, or side-slipping, and stopping at the corners by means of the Christiania swing with the stick. At each corner he will

make a "kick turn," as described on page 101, and then start off on the other tack.

It will, however, be obvious that much time will be lost by this stopping and making of kick turns, and that if, instead of having to do so, he could turn downhill, he would be able to continue his run without interruption. We shall accordingly proceed at once to a description of this invaluable manœuvre.

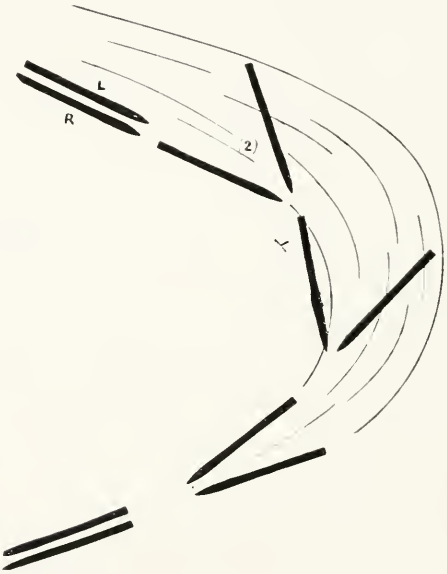

Fig. 52.

The Downhill or S Turn.

The trustful and conscientious pupil who has followed my advice, and practised the snow-plough straight downhill, will not find much difficulty in learning this turn, for *the position of facing straight downhill in the snow-plough position is the crux of the matter.*

Let him begin by choosing a moderate slope, and let us suppose that he is traversing it in the ordinary position for crossing *steep* slopes—that is to say, with the feet just a little apart and the

ski level. Let us also suppose that Fig. 52 represents the slope, that R is the right ski and L the left ski. Then the first thing to do is to reduce the speed to about ordinary walking pace. This may be effected by a touch of the stick coupled with a vigorous piece of stemming with the *left* ski, *taking care not to turn uphill*. The position of the ski should now be that shown at (2) in the diagram. Note that the right ski has not changed its direction a all. Now throw all the weight you possibly can on to the heel of the left ski, and keep it there, pressing it outwards, and at the same time reach right forwards and place the points of the stick well in front of and below you, where the X is in the diagram, keeping the heels wide apart throughout and the points of the ski together. You can thus swing right round in a curve and run off on the other tack, as shown.

The turn should be practiced first of all on easy slopes, where it will not occasion much difficulty, and afterwards on steeper slopes. When practicing on easy ground, try to make as short and sharp a turn as possible, as this will stand you in good stead on the more difficult ground.

The thing to be remembered is to throw the weight of the body well on to the ski which travels on the outside of the curve. This means that the runner has, when facing downhill, to lean outwards away from the slope, which is directly contrary to his natural instinct to save himself by leaning inwards. The leaning-out and placing of the stick well forward and downhill is a great help towards bringing the body into the right position. As a general rule, it is best to keep the ski *flat* on the snow, as when kept flat they naturally slip sideways more easily ; but when the snow is hard, or if there is otherwise any inclination for them to slip too much, they should be edged.

The turn may, of course, be made without using the sticks at all, and in that case it is often useful to help it out with a bit of the Telemark swing, as explained further on.

There is no reason why the beginner who wants to learn the downhill turn should not take advantage of the facilities offered by short, grooveless ski. On the contrary, my advice is that he

should borrow such a pair from a friend and practice for a few days with them. Then, after the knack of the turn is learnt (and it is largely a matter of knack), he can resume his ordinary ski, when he will discover that he can curve quite well enough on them for practical purposes.

The downhill turn has, as we have seen, long been known to ski-runners, but it was discovered quite independently by Herr Zdarsky, and the Lilienfeld school has made a speciality of it. It is obviously of great utility, but extremists of that school have gone so far as to regard it as the most important feature of the sport, and this is, I think, a grievous error.

The turn is, especially on the short, grooveless ski which they use, not very difficult to learn on slopes of a moderate degree of steepness, and when once it has been acquired there nothing is left for its devotees but to seek out and test their skill on very steep and dangerous ground, a proceeding which has been the cause of not a few avalanche accidents.

There is yet another very important point to be noted, which is that the constant practice of the down-hill turn is apt to lead both to a great deal of reliance on the stick and consequent lack of balance, and also to a timorous and slow style of running. Whence those who habitually adopt it have earned the sobriquet of "boglers," which is a barbarous corruption of the German *bogen*, meaning a curve, and which is also doubtless connected with the Scotch verb to "bogle," meaning to circumvent in a hesitating manner.

My view, then, about the downhill turn is that it is *a most useful manœuvre, and one which the beginner should learn at the earliest possible stage of his practice.* I think, however, that *as soon as he has mastered it he should, so far from making a speciality of it, use it only when straight running is for one reason or another out of the question.* Nine times out of ten the making of a downhill turn is a confession of weakness, not an indication of strength.

The Telemark Swing.

To Swing to the Left.—(*a*) From the normal position for running downhill (see Fig. 45), advance the right ski till the right ankle

is opposite the bend of the left ski. Raise the heel of the left foot off the ski and bend well down with both knees, especially

Fig. 53.—Position for Beginning a Telemark Swing.

the left, at the same time throwing all the weight forwards onto the right foot. (For the correct position see Fig. 53.)

Photo by] [*H. Hoek.*

Track of a Telemark.

(*b*) Place the right ski on its left edge (just as when making the snow-plough); turn the body to the left, and lean inwards, as required to sustain the balance.

The result will be a curve to the left, the sharpness of which will depend on the force and suddenness with which the right heel is pressed outwards and the body turned.

Fig. 54.—Incorrect Position.

To Swing to the Right.—Advance the left foot and swing round on it in a similar manner.

An incorrect position often taken up by beginners is shown, Fig. 54.

The above directions sound a little complicated, but the following remarks, which explain the principle of the turn, should help the reader to understand what is meant.

The trouble in stemming was, it will be remembered, the difficulty of preventing the ski crossing one another in front

Photo by] [*E. Meerkamper.*

A Telemark on Tour.

when moving at all fast. The reason for this is that *both* ski are weighted, and, consequently, have a strong tendency to run in the direction in which they are pointing. This tendency when the pace is great becomes so powerful as to overcome any force which the runner can employ to keep them apart.

Now, the Telemark swing is, in principle, very like the stemming

Photo by] [*Bernhard Trier.*

A Telemark. Downhill.

turn, but avoids the difficulty of the ski crossing by getting rid (so to speak) of one of them. Thus, in the turn to the left, it will be noticed that the left ski cannot cross the right for two reasons: (1) Because there is practically no weight on it at all; (2) because any slight tendency there is for it to cross is held in check by the right ankle, against which the bend of the left ski rests throughout the manœuvre.

The point, then, to remember is that *the turn is made entirely*

on one foot, and the secret in getting rid of the other foot is to raise its heel right off the ski till the toe alone rests there.

The tips of the toes of all but ladies of the *corps de ballet* are incapable of sustaining much weight in any position, and not even the divine Mdlle. Genée herself could rest to any appreciable extent on the toe of a foot which is placed behind her.

To practice the turn, choose a smooth and gentle slope and practice running down it in the position shown in Fig. 53. Do not, to begin with, try to turn at all. It will be found difficult enough at first to run straight with the weight all on one foot. As soon as you can do this fairly well, try making the swing slowly

Photo by] [*E. C. R.*

A Telemark in Deep Snow.

by edging the ski, etc., as described in (*b*) of the instructions. Then try to make the swing quickly from the normal position by doing everything described simultaneously. As your skill increases, so should the speed and the quickness of the turn.

The sticks are of no assistance in making the Telemark swing, and though they should be held in the hands when practicing, no attempt should be made to use them.

A good runner can stop almost dead by means of this swing when travelling at a high rate of speed; indeed, allow me to repeat, the difficulty in this as in other turns on ski is not so much to make them, which anyone can soon learn to do after a fashion, as to make them when running *fast*.

The Telemark swing is a very pretty turn when well executed

at a great pace, and is, consequently, more practiced than the less showy, but perhaps more useful, Christiania without the stick, to be presently described.

The Telemark, though it may be made on a hillside, is perhaps more useful for stopping on level ground, as, for instance, after making a jump. It is easiest to perform when the snow is neither very soft nor very hard. It is also very useful for helping out a downhill turn where the ski refuse to come round or begin to run too fast. Entire downhill turns may also be made by means of the Telemark swing, and though perhaps the accomplishment is not of much practical value (for on moderate slopes one does not often require to turn downhill at all, and on very steep slopes the Telemark is, owing to side-slips, somewhat uncertain), it is, nevertheless, a good and amusing exercise.

Photo by] [*H. Hoek.*

A Christiania in Deep Snow.

The Christiania Swing without using the Stick.

To Swing to the Right.—(*a*) Hold the ski well together, with the points level or with the right point a little in advance of the

left. Distribute the weight evenly on both ski, bending both knees a little. (*b*) *Throw the weight forward onto the toes*, and, at

Photo by] [*H. Hoek.*

TRACK OF A CHRISTIANIA.

the same time, thrust round the heels of *both* ski forwards and outwards to the left, *just as you would thrust the heel of the leading foot forwards and outwards in making the Telemark swing.*

This thrusting round of the heels necessitates a twisted position of the hips, legs, and ski, as compared with the upper

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TELEMARK SWINGS TO LEFT AND RIGHT. [*Photos by E. C. R.*

CHRISTIANIA SWINGS TO RIGHT AND LEFT. [*Photos by E. C. R.*

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part of the body, which may be seen very clearly in the photographs.

The body must, of course, be leant sideways to the right, to a degree depending on the quickness with which the turn is made.

On hard snow or on steep slopes the ski should be edged, but on soft snow they should be kept flat, at all events during the first part of the swing.

To Swing to the Left.—Hold the ski either level or with the left point a little in advance, and proceed as above, *mutatis mutandis*.

The Christiania swing involves a peculiar kind of catch of the ski against the snow, which it is difficult to start a-going, but which when once started is easily enough held. The turn is, in fact, exactly similar to that which a speed-skater makes for stopping suddenly on the ice, but it is a good deal more difficult on ski than on skates.

In principle it is the same as the snow-plough, or any other turn, and consists in presenting the ski broadways on to the direction in which one is travelling.

I trust the repetition of the fact is not irritating to the reader, but I would again remind him that the weak spot in the stemming turn is the liability of the ski to cross in front.

We saw how in the Telemark that difficulty was overcome by getting rid of the ski which is on the inner side of the curve by letting it drag unweighted behind. Very well; in the Christiania swing the difficulty is overcome by keeping the ski level and close together, and by pressing the heels of *both* ski round and outwards. There is thus no possibility of the ski crossing in front, though, as we shall see in a moment, unless both ski are equally weighted there is a likelihood of their crossing *behind*.

Fig. 55, on the next page, shows the relative positions of the ski in the stemming turn, the Telemark, and the Christiania swings. (*a*) shows the normal position of the ski for traversing a slope; (*b*) shows the stemming position; (*c*) the Telemark; and (*d*) the Christiania.

It will be observed that in the stemming and Telemark positions the right ski (which is here the inner one of the curve)

is not turned, but in the case of the Christiania the right ski is thrust round and outwards as well as the left.

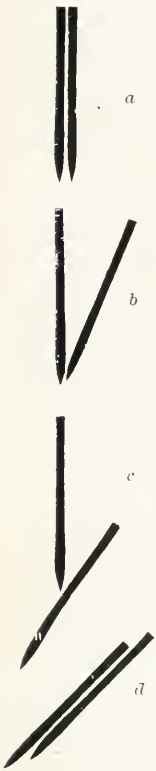

Fig. 55.

Note, too, that as it is the heels of the ski which have to be brought round, the weight of the body must at all events, at first, be well forward on the toes; that is to say, one must lean forward. This is a fact which has, I believe, hitherto been overlooked in the instructions given, it being supposed that on account of the sudden stop which the swing occasions it is necessary to lean backwards. This is, however, not the case, as the sudden stop inclines to throw one out *sideways*, not forwards, and it is necessary to counteract this by leaning sideways and not backwards. In further proof of which, observe that in the photographs the runner is always leaning well forwards, and also that the tendency of beginners is always to fall backwards.

In some treatises on the sport it is insisted that in making the Christiania swing the weight should rest almost entirely on the inner of the two feet which is making the curve, and doubtless on very hard snow it may be possible to make the turn in this way. My experience, however, is that if the snow be at all soft, any attempt to swing on the inner foot invariably results in the heel of the inner ski crossing the heel of the outer ski, slipping on it, and occasioning a fall. I advise, therefore, that both ski should be weighted equally.

In order to arrive at an idea of the position required for the ski in this swing, and also to see why one must lean forwards, try to stop on a gentle slope by simply jumping round sideways. This will be found very difficult if the speed is at all great, but when moving quite slowly it is fairly easy.

Another good plan is to start side-slipping when moving forwards on a steep slope, and to arrest the movement from time to time by pressing the heels downwards. This is, as we have already noted, an invaluable manœuvre on difficult ground, being at

once a more powerful and less fatiguing method of controlling the speed than stemming.

The Christiania swing is a most useful method of stopping, especially on steepish hillsides where, owing to the somewhat constrained position involved, the Telemark is more difficult. It is also, like the Telemark, useful for stopping on level ground after, for instance, a jump. It is both quicker and, owing to the fact that two feet instead of one are used, more powerful in its action than the Telemark. Generally speaking, the harder the snow the easier the swing, for when the snow is hard it is easier

Photo by] A Sharp Christiania. *[H. Hoek.*

to force the ski round into position. On steep slopes, however, it is better for the snow to be a little soft, as, otherwise, the ski are apt to slip too much sideways. It is also quite possible to make downhill turns by means of this swing, and though neither easy nor of much practical value, it is a good exercise for the balance.

The term "Christiania" for this swing is really a misnomer, for it was in use in Telemark long before the inhabitants of Christiania knew anything of the art of swinging. I am uncertain how the term arose, but think that it must have been of German

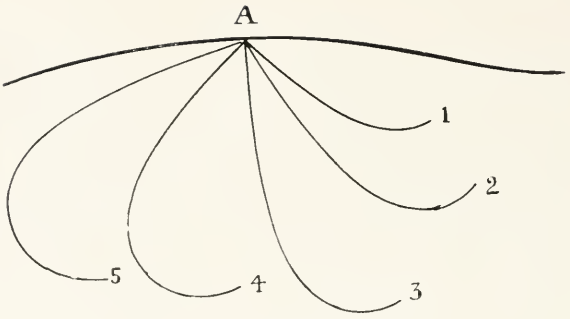

Fig. 56.

Start at A and make swings in the order marked. 4 and 5 are downhill turns and more difficult than 1, 2, and 3.

origin, as the natives of Christiania with one accord disclaim any originality in the matter. In Norway, indeed, both these rapid turns are called Telemark swings; but as they are really substantially different, I have thought it best to retain the erroneous, but now widely-adopted, name of "Christiania" for one of them.

It has been laid down by some writers that it is sufficient for a ski-runner if he can make one or other of these swings

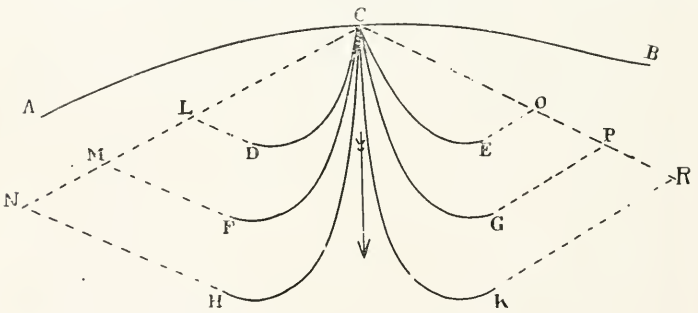

Fig. 57.

A C B is the edge of a steep slope falling in the direction of the arrow. Stand at the point C. Slip over the edge, and at once make a swing to the left, stopping at E. Walk up the dotted line to O, turn, and return to C. Then make a swing to the right, stopping at D, and returning to C *via* L. Next, run a little further down, and swing to G, etc., etc. In this manner the difficulty of the swing is gradually increased.

either way; that is to say, for instance: a Telemark swing to the left and a Christiania swing to the right, the reason given being that when running on difficult ground with one foot in front of the other, there is no time to change the feet. The answer, however, seems to be that it is a bad plan to get into the habit of running with one particular foot forwards, for a change from time to time is a great rest. The swings, too, have their separate uses, and if, for instance, one can make the Christiania to the right only, one is in a difficulty when a sharp turn to the left has to be made on hard snow.

The best ski-runners can make all four turns, viz.: Telemark to right and left, and Christiania to right and left; indeed, I, for my part, should hardly regard anyone as a first-rate runner who could not do so.

A useful way of practicing swings and turns, for which I am indebted to Mr. Caulfeild, is shown in Fig. 56, and another is shown in Fig. 57.

Other Methods of Turning.

It is possible, as noted in the last section, to stop suddenly by jumping round uphill, and I am credibly informed that at least one Norwegian runner can alter his course when traversing a slope by jumping round downhill and going off in the opposite direction! This must, however, be very difficult; and I confess that I, for my part, have never had the nerve to try it. Jumping round may be used as a means of stopping on slightly crusted snow when it is difficult to swing.

Other methods of turning must be regarded as more or less in the nature of tricks. The Christiania swing can, for instance, be made on one leg only, and a well-known Austrian ski-runner has, I believe, a pair of ski with up-turned heels on which he makes downhill turns backwards. Herr Huitfieldt mentions that on one occasion he received an enquiry from America from someone who wanted to know whether they had any use for a man at Holmenkollen who could turn somersaults on ski (to which, it need hardly be added, he replied

in the negative), and it would doubtless be possible to devise other feats of a similar nature which might be performed.

With regard to all of these it may be said that so long as they are practiced in private for the fun of the thing, they are quite harmless—nay, as general exercises of balance, even useful ; —but I, for one, cordially agree with Herr Huitfeldt in condemning their public performance at ski-meetings, where their tendency can only be to degrade our strong and beautiful sport into a mere exhibition of capering.

Photo by] [*H. Hoek.*

A Cornice.

Jumping

PRELIMINARY.

Contrary to the plan which has been hitherto pursued, of beginning a section with strict technical instruction, it is proposed to begin here with some considerations of a general nature. My reason for this is that, whilst other branches of ski-ing have at once appealed to Englishmen as being similar to something with which they were already acquainted, such as tobogganing, mountaineering, skating, etc., and have, consequently, required no apology to make technical instruction in them palatable to the reader, ski-jumping, on the other hand, has still got to win its way, and requires some little introduction, even to many who are otherwise fairly proficient ski-runners.

The best way of effecting this will, I think, be to enquire why English people have not taken more freely to ski-jumping than they, in fact, have done, and in the course of this enquiry, to try to show that this form of athletics is both well worth pursuing for its own sake, and is also of great value to those who wish to excel in ordinary ski-ing.

Are our shortcomings due to lack of opportunity ? Unquestionably to some extent, for there is no doubt that if the British Isles were, like Scandinavia, under snow throughout nearly half the year, we should every year be hearing of fine 100-feet jumps at Hampstead as well as at Holmenkollen.

Nevertheless, I do not share the view of those who think that we shall have to wait for the next glacial period before we gain much proficiency in ski-jumping. Our opportunities are not, indeed, as great as those who live in Norway or Switzerland; but even so far as the British Isles are concerned, do we make the most of those we have? I think not. It should be remembered that not nearly so large a fall of snow is required for ski-jumping as for touring. If a jumping hill is prepared before the snow comes, a comparatively small fall, supplemented by some extra cartloads spread upon the lower part of the track, is sufficient to make it quite safe. This is a procedure which has often to be resorted to, even at Holmenkollen itself, and there is no reason why it should not be constantly resorted to in this country. In the exceptionally mild winter of 1908-9, for instance, it would have been perfectly feasible as far as snow was concerned, to have had several days' jumping on any suitable hill near London, and in Derbyshire, Yorkshire, and the Scottish and Welsh mountains the occasions were to be reckoned in weeks and even months. It is not so much opportunities which are lacking as the men to take advantage of opportunities; and these must be supplied, at all events at first, from those who have had training and experience abroad.

But even supposing snow was an entirely unknown quantity in the British Isles, I should not, on that account, despair of our ever gaining any proficiency in the sport.

There are no foxes or pheasants in Hyde Park, yet amongst those who live in its environs there are, I suppose, not a few who can ride at a fence or hold a gun straight as well as any countryman. In these days of cheap travel, we go far afield for our amusements, and the stream of those who take their winter holidays amongst the snows abroad is an ever-increasing one. The fact, however, remains, that of the many hundreds of Englishmen who every year have ski on their feet for at least several weeks at a time, but a small percentage think of trying to learn more of jumping than they may do by gazing idly at the performances of others.

We who make our little efforts know these people well, and it

HOLMENKOLLEN. [*Photo by E. C. R.*

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must with sorrow be admitted that they are frequently neither the aged nor the decrepit, but young and active men in whom one would suppose that the spirit of adventure would be stirring.

Still, there is doubtless some excuse for those who are nervous about trying their luck on a big jumping-hill. The whole performance appears both difficult and dangerous in the extreme, and it seems almost impossible to convince people that it is otherwise. Nevertheless, I must try to do in writing what I have frequently done by word of mouth: that is, to coax the timid to stand over a big jump, just once. For I know that, once the first leap has been taken, once it has been discovered how delightful is that long rush through the air, and how harmless and amusing are the desperate-looking gyrations in the snow which at first usually succeed it, nobody will rest content till he has stood well and truly on a really steep hill. And that, reader, is the moment of a lifetime. Well do I remember it in my own case. It was at the Swiss meeting at Glarus, in 1904, when the Norwegians, who had in the previous year lent the jumping competitions their support, were unable to attend, and when the organizers were most anxious to secure as many entries and as much extraneous aid as possible. The evening before I had been practicing on some small jumps, and had stood fairly well, whereupon I was pounced upon and told that I must enter for the big event. I pleaded lack of skill, for though I had years before stood over the Holmenkollen jump, it was on a day when the snow was slow and the take-off had not been built up to any height. With that exception, my experience had hitherto been confined to small jumps, taken haphazard on tour and on the practice ground. But excuses availed me nothing, and as I dared not say I was afraid I put the best face on it I could, and said I would enter for the fun of the thing. The fun of the thing, indeed! My sensations were, I confess, really far from mirthful, and that night my slumbers were troubled with visions of broken legs and arms and other horrors.

Next morning we watched the races, and then came lunch, and after lunch the competition. As I approached the hill I

began to regret more and more my foolishness in having let myself in for this breakneck affair. The hill seemed steeper than it had ever done before, and when standing at the bottom I noticed for the first time that I had to strain my head backwards to look up at the take-off. From the starting-place the prospect was even more alarming. A short, steep approach, very short and steep in those days, with no convenient level ground to start from, then an edge, and then, far below, the plain with doll-like human beings moving about on it, much as one sees them from the top of St. Paul's Cathedral. No out-run visible at all, though I knew it was there and that it was lined by spectators.

The Glarus hill is really a capital one, but in appearance it is to my mind more alarming even than Holmenkollen itself. One of the two competitors remarked to me that it was *unheimlich*, and I felt that he was absurdly under-stating the case.

We were soon all assembled, and there followed a great stamping of the snow and a great clearing of the course. The preparations were completed, and one of the judges shouted for the first man—Herr ——! He was ready and off at once, sliding down the approach, and in a moment disappeared over the edge. Wow! but it looked awful! I do not remember now whether he stood or fell, being, I suppose, at the time too much taken up with my own feelings to note anything very carefully. Others followed, some standing, some falling, but all greeted with some measure of applause from the spectators, for ski-jumping in Switzerland was new in those days, and people were not then so critical as now. I felt as though I was waiting my turn at an execution; but, somehow, when at last my doom was sealed, and the words "Herr Richardson" rang out from the tribunal, some measure of courage returned to me. Yes, I would do what I could, and if I fell it should not be through sheer funk. I would lean forward, lean forward, lean forward; for therein lay, as I well knew, my only hope. So, bidding adieu to my fellow-sufferers, who were to follow me, and muttering my little maxim to myself, I started off down the track. Almost in an instant I was at the edge of the take-off, and then the earth was withdrawn from beneath my feet, and I shot out into space. B-r-r-r! how the air rushed

past ; and then—pat ! Yes, I had stood, and was tearing down the gradient at the speed of an express train. That was a moment of inexpressible joy and triumph. I had the feeling of having achieved the impossible, and that the impossible was both easy and delightful. Now the bottom of the hill was reached, and with the cheers of the spectators ringing in my ears I was out into the level. I would show them what a Telemark swing was, that I would, though it be taken at a speed which I had never before attempted. Swish ! and I was round, and, as luck would have it, without a fall. Why, jumping on a big hill was no more difficult than on the little things that I had previously attempted, and with that thought I scrambled back to repeat the performance. The second time I had again the good fortune to stand, which won for me a prize ; but on the third occasion, puffed up with pride, I tried too much and fell helter-skelter, all of a heap, to the bottom of the hill. Hurt ? Not a bit, though my friends told me afterwards that I had turned three somersaults and looked as if all the bones in my body must be broken. True that on getting up I found that the point of one of my ski had been snapped off, but that was the one and only casualty amongst the jumpers that day.

And so it is at all jumping competitions at which I have attended, both as competitor and spectator. Of the thousands of leaps I have witnessed, only two have resulted in injury of any sort, and those were cases of a sprained ankle. The reader is, therefore, entreated to believe that jumping on a big hill, where the snow has been properly prepared, is not the breakneck business it appears, but is, on the contrary, one of the safest forms of ski-ing in which he can indulge. Nor is it a whit more dangerous for the veriest tyro than for the greatest expert, for the steepness of the hill and the firmly-packed snow break practically all falls to such an extent as to render them innocuous. On the other hand, when one stands, the speed and rush and joy of the thing are, I am certain, unequalled in any other form of sport whatsoever.

" Ah ! but," I hear someone say " it is so difficult and takes years to learn ; we are not all like you, who had previously had

so much practice on little jumps" ; to which it may be answered that it is not really so difficult, and that, though, of course, one must make a beginning on small jumps, no very long apprenticeship is necessary. A month's practice at all-round ski-ing, with an occasional afternoon spent on little jumping-hills, should be ample. After that I would have every ski-runner stand once at least over a big jump, if only to see how harmless it is. A small jump may, indeed, under certain circumstances, be much more difficult than a big one ; it is largely a matter of the height of the hill and of the take-off, of which more anon.

I do not, on the other hand, wish to be understood to say that ski-jumping is easy—far from it ! To be a really good jumper, one must practice long and assiduously on all kinds of hills under all conditions. Still less do I desire to convey the impression that my performance at Glarus was a wonderful one. On the contrary, barring the fact that it was a standing jump and my first attempt on a big hill, I feel no sort of pride in it whatever. It measured but a paltry 50 feet, and its execution from beginning to end was clumsy and uncertain. On the same hill, at a meeting held the following year, Herr LeifBerg, the well-known Norwegian runner, jumped over double the distance with the most absolute ease and firmness. I only quote my own case to show that if he but make up his mind to it, quite an indifferent ski-runner can stand after a fashion on these difficult-looking competition hills, and that if he falls nothing dreadful is likely to happen to him.

I remember talking in this strain once to a young Englishman whom I met on a competition hill. It was the first time he had seen proper jumping, and he was evidently impressed, though, as he had learnt his ski-ing from those who affect to despise this branch of the sport, he deemed it unwise to express much enthusiasm. "You see," he said, "I don't quite understand what use this is going to be to me ; I go in for ski-mountaineering, and, of course, there can be no talk of 30-metre jumps on a mountain tour."

Quite so ; nobody ever suggested anything of the kind ; but allow me to indicate how jumping may, nevertheless, be a profitable exercise.

In the first place, there seems to be no reason why, even supposing ski-jumping were quite useless, as far as mountain or other touring is concerned, it should on that account be deemed valueless and tabooed. Mountain touring is surely not everything, and even if it were there are many days on which, owing to the weather and other conditions, it is simply out of the question. The snow may be too fresh fallen and soft, or there may be mist, or one may simply not have sufficient time for a long tour. On such occasions an afternoon on the jumping-hill makes a delightful change, and the tourist will afterwards return with all the greater zest to his beloved mountains. Also, he will return a better ski-runner and better able to enjoy those opportunities for the exercise of skill which a mountain tour affords. For it cannot be too strongly insisted that jumping is the *very best possible training for all-round technical excellence.* Up to a point, indeed, skill is certainly gained by touring, but it is mostly skill of a negative order. One learns how to brake and steer the ski when moving slowly, and, in general, how to avoid difficulties as they come ; but of the subtle balance which enables a good runner to stand when an unskilled will fall, and of dash and of speed, one learns little or nothing. I have, indeed, met a few, a very few, good cross-country men who were not jumpers ; but, on the other hand, I do not know of a single good jumper who is not also a fine runner across country, a lover of the mountains, and a keen tourist to boot. It was at one time supposed by some that the Norwegians who came to Central Europe and who had gained their experience on the jumping-hills and on the only moderately steep country round Christiania, would not make so much of a show when it came to a mountain expedition in the Alps. But those who thought so were soon disillusioned. The longest and most arduous mountain tours were performed by these slim, not overstrong looking young men, and ground which had previously been thought too steep and difficult for anything but the most cautious zig-zagging and curving, was by them taken straight at top speed, with the greatest ease and in the most perfect safety.

Nor are the reasons for the good training which the jumping hill affords far to seek. For it must be patent to most people

that the successful performance of, say, an 80-feet leap, calls for the exercise both of courage, judgment, and a cool head, qualities which are of inestimable value to the tourist.

On the necessity for courage I need hardly insist; in that connection all that need be said is that in order to stand one must do just the very reverse of one's natural inclinations; that is to say, one must lean and spring forward, for to lean backwards and shrink from the edge of the take-off is fatal to success. But mere courage is not all. A good leap cannot be executed just anyhow. A peculiar spring is necessary which must be taken at exactly the right moment, and the carriage of the body in the air and on alighting must be of a certain kind and under complete control throughout. These are actions which call for coolness and judgment under the most trying circumstances, but without them success is impossible. The first thing, indeed, which a jumper has to learn is how to keep calm and collected, and how to make up his mind instantly what to do next when travelling at top speed, just the very things, in fact, which he must learn if he wants to be a good cross-country runner. On the jumping-hill he can practice these things constantly and under conditions which, in the event of a tumble, need cause him no anxiety; for the snow on the jumping-hill is trodden down and firm, and consequently safe, whereas on tour not only are the opportunities for really fast running less frequent, but when they do occur the risk in the case of a fall is greater, for the snow is frequently soft and loose. Add to this the awkwardness of an accident occurring far from home, and it must be clear that long, straight slopes when encountered on the mountains can only be taken at a high rate of speed—that is to say, enjoyed to the full—by those to whom, owing to previous training on jumping-hills, they present neither danger nor difficulty.

One more little matter and I have done. Nobody when he has stood after a jump desires to allow the speed gradually to die away. Everybody wants to get back to the top of the hill and repeat the performance again as soon as possible. Hence, the invariable custom of stopping with a Telemark or Christiania swing; so that practice on a jumping-hill also includes

the practice of turns, as to the value of which on tour we are all agreed.

I think, then, that I have now said enough to convince the reader that the objections which are often urged against jumping are both groundless and foolish ; that the sport is a fine one and well worth pursuing for its own sake, and that also it affords the very best training for all-round excellence on ski.

JUMPING-HILLS IN GENERAL.

Fig. 58, on the next page, shows the Davos jumping-hill. The lower part of this hill is steeper than in most others, measuring in one place as much as 34 degrees ; whereas the Feldberg Hill measures 33 degrees, the Solberg, near Christiania, 32 degrees, and Holmenkollen itself only about 26 degrees ; but in other respects the Davos hill may be taken as typical.

The procedure in jumping is as follows :—The runner starts from the point A, travels at an ever-increasing speed till he reaches the eminence at B, whence he leaps, alighting somewhere about C. If he stands he thence continues his course at headlong speed to the bottom of the hill, where he stops as soon as he can by means of a Telemark or Christiania swing.

It will at this stage be convenient to designate the different parts of the hill by the special names by which they are called. The little eminence at B, in the middle of the hill, is called the " take-off." The part of the hill above the take-off is called the " approach," and that below the " alighting-ground." The part of the hill where it joins the level is called the " outrun."

The length of the jump is measured by a straight line drawn from the edge of the take-off to the deepest part of the mark made in the snow by the runner's ski on alighting. The length of the jump is dependent :

(1) on the speed of the runner when he reaches the take-off ;
(2) on the power and accuracy of his leap ;
(3) on the steepness of the alighting ground ; and also,
(4) on the angle which the take-off forms with the alighting ground.

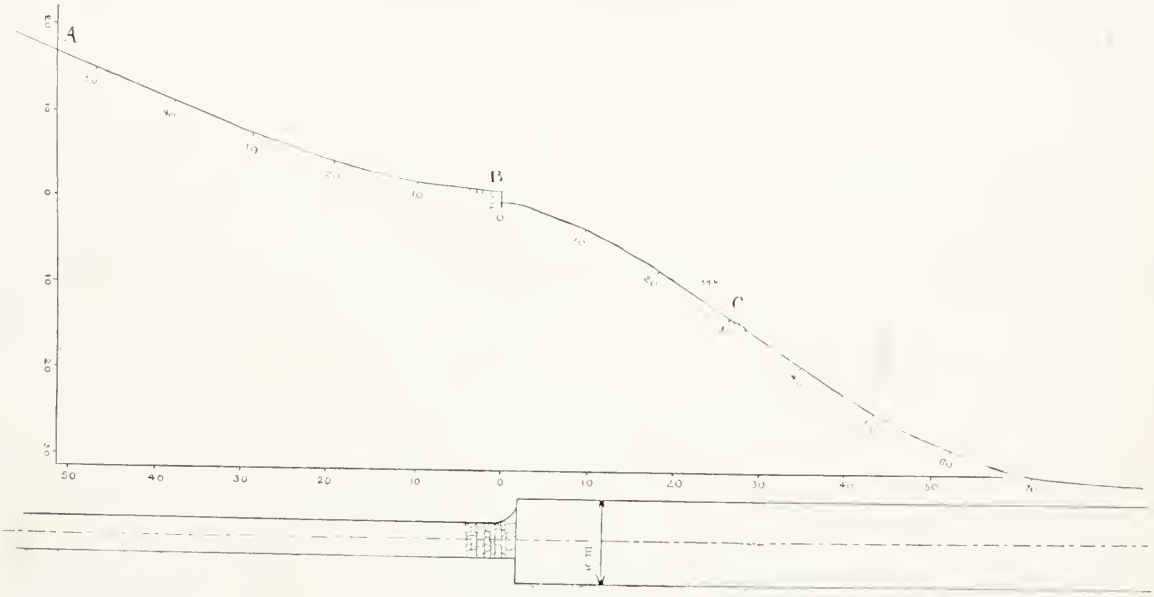

Fig. 58.

These are factors the precise inter-relationship of which to one another is obviously of a highly complicated nature, and the analysis of which would be more appropriate to a mathematical treatise than to a book of this sort. It will, however, be necessary to explain briefly the parts played by the alighting-ground and by the take-off when we come to deal with these features of the hill ; for the present it is sufficient to note that the leap which the runner himself gives has a much greater influence on the length of the jump than might be at first supposed. In illustration of this it may be mentioned that at the competition on the Feldberg jumping-hill, held in 1906, the best leap amongst the German competitors amounted to 26 metres, the average being only about 16 metres ; whilst amongst the Norwegians who gave an exhibition *hors de concours*, the longest jump was 36 metres, and the average about 30 metres.

Now, whilst as far as practicing on small jumps is concerned a useful and amusing enough arrangement can be made on any hill, nevertheless, when it is desired that long jumps should be the order of the day, as, for instance, at a competition, great care has to be exercised both in the selection and in the preparation of the hill.

The best plan, therefore, seems to be to begin here with a consideration of the requirements which have in practice been found necessary to a good competition hill, and to see later how they may be modified and altered for small jumps. For, with jumping-hills, as with other things, the greater comprises a good deal of the less.

COMPETITION HILLS

should all approximate in contour to that shown in Fig. 58 that is to say, they should consist of an approach, a take-off, an alighting-ground, and an outrun. Firstly, then, as to

The Approach.

It matters little what is the nature of the earlier part of the approach, so long as it is steep enough and long enough to ensure a good rate of speed. If it includes large and

sudden inequalities, these should be removed; but if the inequalities do not tend seriously to upset the balance, they may be neglected. The latter part of the approach is, however, of great importance, and should, for a distance of at least twenty metres above the edge of the take-off, be without lumps or bumps of any kind. This part of the approach should also join easily to the ground above it, so that the runner should, when he arrives at the take-off, feel perfectly steady and comfortable. The difficulties involved in making the leap are in themselves sufficiently great and should not be enhanced by the runner's balance being in any way disturbed when about to make it. The gradient of these last ten yards or so should be quite a gentle one, not, indeed, absolutely flat, but just steep enough to ensure that the speed gained above should be sustained. The width of the approach should be about five metres, for a good wide approach allows of the competitors following one another for some time in quick succession without any smoothing-out of the track being necessary, as each has then room to make a new spoor for himself.

The Take-off

is an important part of the jumping-hill. It should form a continuation of the last part of the approach, and should, like it, be inclined downwards, only very slightly. If the take-off points downwards too much, though it is then easier for the runner to stand after alighting, nevertheless, it is difficult for him to *leap* in the proper manner; and as, further, his flight through the air will be close to the ground, his jump will in consequence be short. If, however, the take-off points upwards too much, he will be shot too much upwards into the air, and it will be difficult for him to stand on alighting, both on account of the pressure on his legs on alighting, and also on account of the increased difficulty of getting into the proper position when making the spring. It is most important to understand the connection between the shape of the take-off and the kind of leap taken before proceeding further; so let us suppose three different jumping-hills in each of which the approach and the alighting-ground are of the same

gradients, but in which the take-off points differently. Fig. 59 shows the contours of three such hills. In the first of these the take-off points downwards, in the second it is nearly level, and in the third it points well upwards.

Now, without going into any scientific exposition of the fact, the reader may take it for granted that the correct position for glissading on ski is with the body at about right-angles to the lie of the ground. It is, indeed, possible to proceed for a *short* distance with the body either forwards or backwards of this posi-

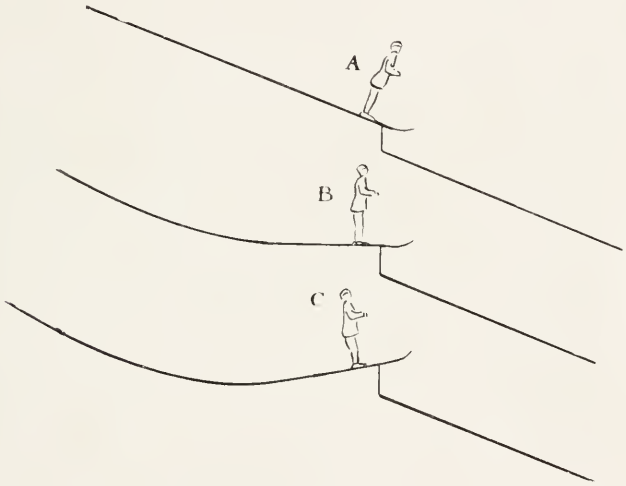

Fig. 59.—A will probably stand, B and C will certainly fall.

tion, but only for a short distance, as otherwise a fall forwards or backwards will result. Hence, the natural inclination of everyone is to keep the body at right-angles to the ground as stated. Let us see, then, what would be the consequences of following this natural inclination on each of the above take-offs. The little men in the diagrams show the natural positions in which they would there find themselves. So far so good, but what about the alighting ground below ? There the correct position is also at right-angles to the ground. In looking into the matter, we see that

in the case of the hill in which the take-off points downwards, the body when it leaves the take-off is already in correct position for the alighting-ground, and, consequently, it is easy to stand on such hills. In the case, however, where the take-off points only slightly downwards, and still more in the case where it actually points upwards, it is plain that if the runner continues in the positions shown in the diagrams he will, on alighting, fall backwards, for his position will not then be at right-angles to the alighting-ground. It follows, therefore, that in these two last cases he must swing his body forwards before leaving the take-off, so as to get into the proper position for alighting before starting off on his flight.

It is just in this swing forwards—combined, in the case of a good runner, with a powerful spring forwards—that the whole art of jumping lies. It is the swing forward which supplies most of the impetus on which the length of the jumping depends; for though a spring upwards also helps, it does so only in a lesser degree. If the runner comes forward rapidly with power and force, the jump is a long standing one; if he comes forward feebly, though he may stand, the jump will be short; and if he does not come forward at all, he will, when the take-off presents an angle with the alighting ground, certainly fall. It is, however, evident that whilst the length of jump is up to a point increased the more the runner has to swing forwards, there also comes a point when the amount of the swing forwards becomes difficult to execute with sufficient power and accuracy. As regards this, practice has shown that when the take-off points just a little downhill the manœuvre is easiest, but that as the take-off points more and more upwards so does its execution become more and more difficult.

There is another point as to the lie of the take-off which is mentioned by Herr Huitfeldt in his book, but as to which my personal experience is insufficient for me to form any opinion. It is this. In cases where the take-off and the approach form a continuous inclined *plane* for some distance before the edge of the former is reached, the runner must himself decide just where to make his spring, in order that it should be made neither too early nor too

late. But if, on the other hand, the take-off forms with the approach a curved surface, and if the curve begins just where the runner should spring, then he will receive a hint from the ground itself as to when he should take his leap. Herr Huitfeldt considers that this curve is a valuable feature which should be embodied in a modified form in all competition hills. It is not, however, actually adopted in any of the principal Norwegian,

FISKARTORPET, STOCKHOLM.

Swedish, or Continental hills which I have seen, for though in these the take-off and the approach always form in their entirety a curve, the last part of them for some little distance from the place from where the runner takes his spring are approximately inclined planes without any appreciable curve in them at all.

What shall be the height of the take-off? A very natural question this, but one to which a little consideration will show it is impossible to give a definite answer. For suppose that

A B C D E (Fig 60) represents the contour of an imaginary jumping-hill, without any built-up take-off at all, and let C A represent the length of a jump made on such a hill, then it is plain that if we cut into the hill at D, and clear away a big piece, D X Y Z B, and if the runner jump just as before but from D, instead of from C, his course through the air, and consequently his jump, will be just the same as before except that he will now alight at B instead of at A. The appearance of the hill will now, however, be very different, for instead of the harmless-looking angle E C A, we shall have a formidable-looking drop at D to alarm a beginner and to enhance the spectacular effect of the leap. It is, therefore, evident, from the diagram, that height is no test of the character of the take-off, but that the proper way of judging its

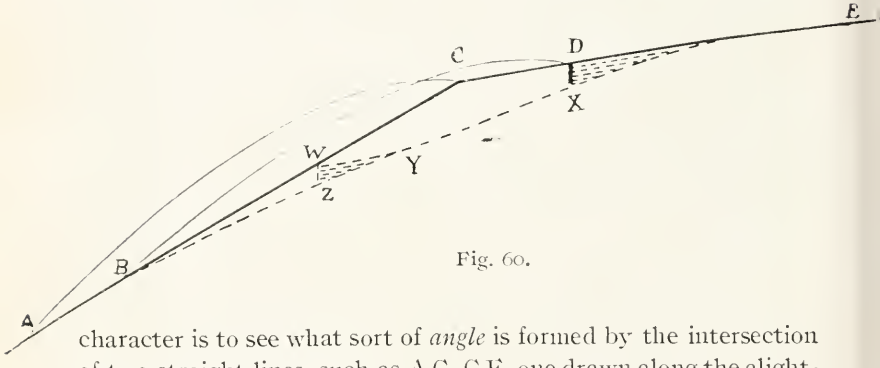

Fig. 60.

character is to see what sort of *angle* is formed by the intersection of two straight lines, such as A C, C E, one drawn along the alighting-ground, and the other along the take-off. This sounds complicated, but it will be plain if the diagram is referred to, and the principle is worth studying.

There is, also, a further lesson of a very important character to be drawn from a consideration of Fig. 60. It is that if the contour of the hill be in nature similar to that shown by the dotted line B Z Y X E (as is, indeed, often the case), and if a sufficient length of alighting-ground is not available when the take-off is arranged on the brow of the hill, as at W Z Y, we may, by simply building the take-off higher and placing it somewhat back from the brow, as at X D E, cause the runner to alight considerably higher up the hill without in any way affecting the true character

of the arrangements. In practice this is resorted to on all competition hills, for not only are long steep alighting grounds, which are also in other respects suitable, of rare occurrence, but the enhanced spectacular effect caused by the sudden drop at D also for obvious reasons counts for something.

It is, however, to be noted that when the take-off is placed back in this way its edge should not be at a greater distance from the steepest part of the alighting-ground than about 15 metres, which distance represents about the shortest leap usually made

Photo by] [*E. C. R.*

Solberg Hill, Norway, in Summer.

at competitions. For if the take-off be built too far back and of insufficient height, a runner who jumps short will alight on flat ground, and will, consequently, find great difficulty in standing.

As regards the material of which the take-off should be built, the best plan is to build it of wood, and to make all the engineering arrangements before the snow comes at all. The photograph shows the Solberg Hill in summer, and explains the nature of the construction better than many words. The figure standing beside it is that of a boy about 4 feet 6 inches in height.

The Alighting-Ground

has already been considered to some extent in the foregoing. On its steepness depends to a large degree the length of

the jump made. Thus, in Fig. 61, where A B and C B represent a flat and a steep alighting-ground, and where the curved line represents the flight of the runner through the air, it is evident that the leap is considerably longer in the case of the steep alighting-ground. Contrary, however, to what one might expect, the steeper the alighting-ground the easier it is to stand. For, after a long flight downwards through the air, the pressure on the legs and general shock when alighting on flat ground is very great, whereas on a steep hill it is hardly felt at all. For similar reasons the steepness of the alighting-ground also greatly makes for safety. For, if one comes to think of it, it is never the actual falling which hurts, but rather the bump against the ground, and on a very steep snow-hill there is no bump.

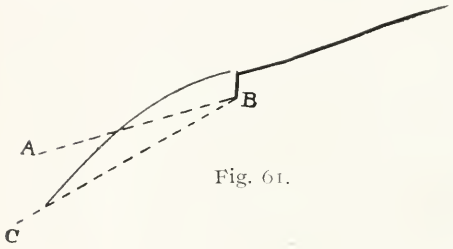

Fig. 61.

For competition purposes 30 degrees or even more is a useful degree of steepness, whilst 26 degrees may be regarded as the minimum. The steepest part of the gradient should begin about 15 metres from the edge of the take-off, and should persist for a distance of about 25 metres (say 50 metres in all) from the edge of the take-off, after which it should merge gently into the outrun.

The alighting-ground should be of sufficient breadth to prevent any risk of a competitor, who may jump a little crooked, rushing into the spectators and causing an accident. A width of ten metres immediately below the take-off, widening to at least double that distance at the bottom of the hill, is suitable.

The Outrun

is that part of the hill which connects the alighting-ground with the level. It should perform this function as gradually and as easily as possible, premising that the total distance from the edge of the take-off to the level should not exceed about 80 metres. To have the hill longer than this serves

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A SWEDISH JUMPER. [*Photo by Almberg & Preinitz.*

no useful purpose, and only means that the competitors will have a long way to walk up between each jump.

If the alighting-ground does not connect at its lower end with ground which is perfectly level, it does not so much matter, provided that the gradient is not very steep and the runner has room to swing round and come to a standstill ; but a short abrupt outrun is to be avoided at all costs, for the speed of the runner downwards after a long jump is terrific, and the legs of nobody are strong enough to stand the strain thrown upon them by a sudden change of level at the bottom of the hill.

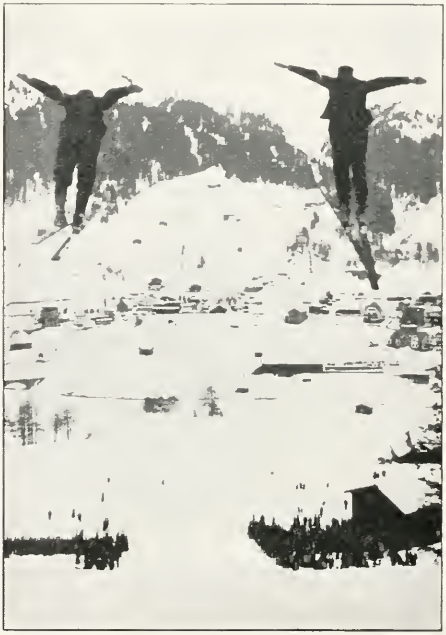
Site of Competition Hills.

They should, if possible, be selected on slopes facing towards the north, or, at all events, not due south, so that the rays of the sun shall not strike too directly onto the snow, and so (perhaps during a competition) alter its speed and consistency.

Preparation of the Snow.

The snow should be firm and compact, though, of course, not actually hard. By far the best way of bringing it into the right condition is for a party of ski-runners to stamp vigorously up and down the hill with ski on their feet. This should be done the day before the competition is to be held, as, though immediately after the stamping the snow may still be too soft, it will, if left to itself for some hours, settle and become considerably firmer. The 15 metres or so immediately below the take-off may, of course, be left alone, as that particular part of the track is untouched by the ski of the leapers ; but all the rest of the course, including a liberal space of the level ground at the bottom of the hill for the swing, should receive uniform and careful treatment. Immediately before the competition begins the stamping should be repeated, special care being devoted to the last twenty yards or so of the approach, and to the alighting-ground. The office of stamping down the snow is one which a body of spectators is always ready to perform, and constitutes a pleasant bond of good feeling between them and the competitors. During the competition three or four men

should be stationed with rakes on either side of the last twenty yards or so of the approach, and a party of about half-a-dozen ski-runners and two men with spades should line that part of the alighting track where most of the leapers come to ground. It will be the duty of these, at a signal from the umpire, to dash forward from time to time and arrange the track. If the snow has been properly prepared beforehand, and if the competitors



[*Photo by* [*E. Meerkämper.*

A Double Jump.

are fairly skilful, the spades will not be required very often, but it is just as well to have them handy in case any very heavy person should make an unusually deep pit.

It sometimes, of course, happens that sufficient snow has not fallen to make the alighting-ground safe, in which case more may be added by hand. A depth of about 1½ feet of really well-packed,

firm snow may be regarded as the minimum of safety, and the alighting-ground and take-off should be covered to at least that depth.

Concluding Note.

A perusal of the last few pages will, even if it has done no more, at least have convinced the reader that the laying out of a first-class jumping-hill is not such a simple matter. Nature is by no means prodigal of really suitable slopes in the vicinity of ski-ing centres, and art has frequently to be called to her assistance The portions of the track which usually stand most in need of such help are the last 20 yards or so of the approach, which are commonly too steep, and the outrun, which is usually too abrupt. It is, indeed, frequently necessary to spend considerable sums of money in cutting away or in adding earth, as may be required, at these places. Money laid out in this way is, however, even from a strictly business point of view, always a good investment, for both competitors and public are attracted by competitions held on a first-rate hill, and a modest levy of gate-money will soon repay the original outlay plus a handsome rate of interest. And then, as far as the progress and propagation of the sport is concerned, a well-organized jumping competition, in which *both experts and beginners* take part, is unquestionably by far the best advertisement it can have, and will attract to it more votaries than many magic lantern shows or many descriptions of mountain tours.

At the time of writing it is scarcely premature to consider the possibilities of holding a ski meeting somewhere in the Welsh or Scottish mountains; at all events, the time is certainly not far distant when it may be perfectly feasible to do so, and when this is decided on it should be remembered that it is eminently desirable that a really good jumping-hill should be prepared *some time in advance.*

There is also at present a prospect of at least one ski hut being built in the mountains of the United Kingdom, and not improbably there will, in a few years' time, be several others. It is unlikely that the organizers of schemes of this kind will, at all events at present, themselves be jumpers, but it is none the

less desirable that they should have an eye to the future, and that when choosing a building site they should select one close to a slope suitable for jumping. As has before been observed, there are many days on which the mountains are, owing to weather conditions, out of the question ; and on these, if on no other occasions, a good jumping-hill near at hand is a most valuable adjunct.

To sum up this section : Competition-hills should approximate to the outline shown in Fig. 58. The last 20 yards of the approach and the take-off should be very smooth and should point slightly downwards. The take-off should usually be built a little distance back from the brow of the hill. The alighting-

Photo by] [*Kerry & Co.*

JUMPING AT KIANDRA.

ground at a distance of 15 metres from the take-off, and thence for another 35 metres, should be smooth and of a steepness of not less than 26 degrees. The outrun should merge gently into level or nearly level ground. Engineering operations should be performed as far as possible before the snow falls, and when a competition is to be held, the snow should be prepared on the previous day. A depth of 1½ feet of snow on the alighting-ground and outrun is the minimum of safety.

PRACTICE JUMPS.

Under this heading it is proposed to treat of some of those smaller kinds of jumps which can be constructed on any hillside with little or no expenditure of labour, and on which every ski-jumper, be he beginner or expert, delights to

essay small flights. A few examples of such will be given to show the reader what is meant. But from the very nature of the case, exhaustive instructions are out of the question. The charm of these little jumps lies in their variety and informality, and in the choice and preparation of them everyone must use his ingenuity and discretion.

A keen ski-runner is always on the look-out for sudden little unevennesses and dips on a hillside which will serve his turn, and even in summer will often find himself taking stock of a nice-looking slope and turning over in his mind the advantages and disadvantages of certain sites for the take-off. It is, indeed, an unfortunate fact that some of the likeliest jumping-hills, which really looked as if they had been specially designed by nature for the purpose, are situated in countries in which snow never falls, or, what is even more tantalizing, where it falls only rarely and in insufficient quantities.

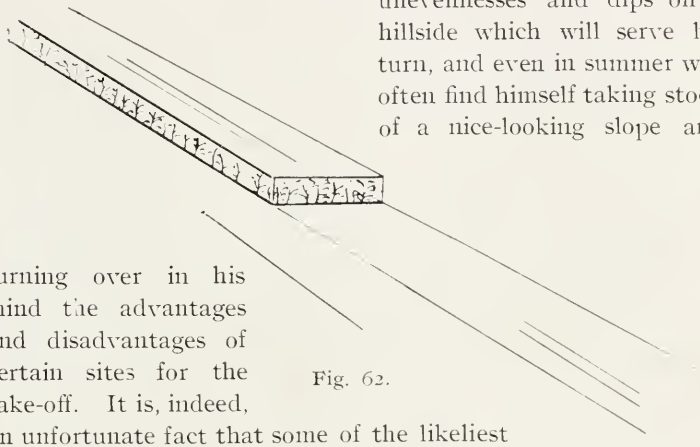


Fig. 62.

Practice jumps, though they occur in every shape and form, may, nevertheless, be conveniently divided into three classes, viz.: those in which the take-off points frankly downwards, those in which it is about level, and those in which it points upwards. Let us then consider these in turn.

Practice Jumps on which the Take-off Points Downwards

are very easily constructed on any fairly smooth and steep hillside. Fig. 62 shows how this may be done. A series of stakes, of branches plucked from trees, or an old box or two, or something of the sort, is thrust into the side of the hill, and above this snow

is piled so as to form a longish platform connecting gently with the hill above. This forms the take-off, which may begin by being a foot or two high only, but as the leaper acquires skill and confidence, may gradually be raised by the addition of more snow. This kind of jump is very useful for accustoming beginners to steep and alarming-looking hillsides; for, as we saw before, the fact of the take-off pointing downwards makes standing an easy matter, and the first thing to learn is some degree of con-

Photo by] [*Professor Liefmann.*

A Double Jump. Both Leapers Stood.

fidence and steadiness when travelling fast. The steeper the hillside chosen the better (30 degrees is about right), provided that the outrun is not too sudden. If the snow is freshly fallen and soft, the alighting ground should be stamped down, though if it is fairly well set one need not bother so much about this, as the steepness of the hill and the lowness of the take-off will prevent any shock on alighting. The objections to this class of practice jumps are that it requires a certain amount of preparation, best

accomplished with spades, which are not always available, and also that though it is easy to stand on, yet actual leaping from it is, as we saw above, a difficult matter. The beginner is, consequently, advised not to practice on such hills more than is necessary to give him confidence.

Practice Jumps on which the Take-off is About Level.

These may be regarded as miniature competition jumps, and the directions given in the preceding section may be referred to for making them, and may be modified as circumstances demand. The alighting-ground, for instance, need not be so steep, and as the speed will not be so great the outrun need not be so carefully engineered. The plan of building the take-off back from the brow of the hill should be borne in mind, as it frequently enables one to avail oneself of alighting-grounds which would otherwise be too short. When preparing jumping-hills of this kind it is sometimes a little difficult, owing to the approach being invisible from the alighting-ground, to judge the line of the jumper's flight, and to stamp down the snow at the right place. A good way to keep the course straight is to plant a ski stick on the middle of the take-off and another higher up in the middle of the approach. A straight course below may then be secured by keeping the two sticks in line.

Herr Huitfeldt gives the following account of how jumps of this kind are often made in Telemarken without any digging with spades. The Telemarkings "take off their ski and tread out a small path for a distance of about two ski lengths upwards from the place where the edge of the take-off is to be. By the treading down of the snow with the feet, the loose snow is at the same time thrust forwards towards the edge of the take-off. To make the take-off a little firmer so as to resist the leap taken, they lay a few spruce branches at the edge, and with the aid of the ski shovel snow on the top so that the branches are well covered. Then one of the party makes a track upwards with ski on his feet so that the whole take-off at the finish looks like a long and narrow gutter slightly concave, and with an easy connection with the hill above. Below the take-off on the ground where the ski-runner after his flight

through the air may be expected to alight, a party of ski-runners treads down the snow with ski for a distance of ten metres, so as to prevent the leaper when he alights from sinking too deeply into the snow."

Practice Jumps on which the Take-off Points Upwards.

These are found practically ready-made almost everywhere, and join with recent biological discoveries to give the lie to the proverb, "*Natura haud facit saltus.*" Snow drifts, tree stumps, stones, tufts of grass, etc., in short, any mound on any hillside, may be pressed into service, and often without any preparation at all, or at most with a little scraping together of the snow and a pat or two with the ski.

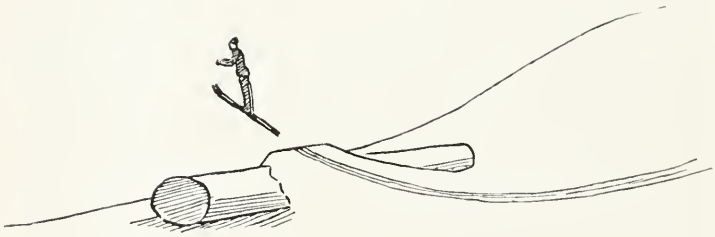


Fig. 63.

Fig. 63 shows how such a take-off may occur quite naturally over a log of wood, and the reader will have no difficulty in finding for himself any number of similar arrangements; yes, and I suppose I must add, that he should be careful that the log has a sufficient covering of snow on the top of it, for if I do not, some Simple Simon will be pitching on his head and blaming me for the accident.

Practice on these *spraet* or squirt jumps is of an amusing and very instructive character. In contradistinction to that in which the take-off points downwards, it is here impossible to stand by simply slouching over the edge anyhow. It is necessary to make some kind of spring, and the making of the right kind is considerably assisted by the lie of the ground.

One may begin by arranging the take-off almost level, and then, as skill is gained, snow may be piled upwards onto the edge, till at last one is shot really high up into the air. The alighting-ground, which should, of course, have received some preliminary stamping with the ski, may be either steep or flattish, though, in the latter case, long jumps are, on account of the pressure on the legs, out of the question. Nevertheless, some practice on small

Photo by] [*W. Lamm.*

A Triple Jump.

jumps of this kind arranged so that the runner alights on flattish ground after a leap of, say, 15 feet or so, is very desirable, for a little pressure on the legs teaches him how to place himself almost instinctively in the right position for alighting, of which more anon.

The speed over jumps of this kind need not be so very great, so that it is not necessary to trouble much about the outrun ;

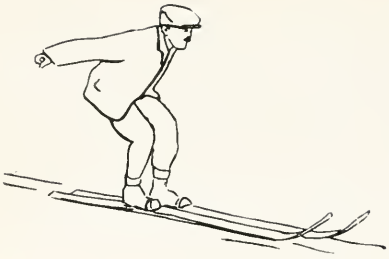


Fig. 64.

indeed, it is good practice to place these "squirt" take-offs (as they are called in Norway) fairly high up on a hill with a reasonably steep gradient for the outrun, say, 15 to 20 degrees, so as to practice stopping after the leap by swinging on the hill-side.

Summary of this Section.

Begin on jumps with take-offs pointing well downwards built on very steep slopes to get used to the speed. Then proceed to level take-offs and "squirts." The last-named are the most easily-made, and are probably also the best all-round practice.

HOW TO JUMP.

Take your station at a suitable distance above the take-off. Just how far depends, of course, on the speed at which you intend to arrive there. At first you will naturally be disposed to be nervous about this, and to arrive with too little speed; it is therefore a safe

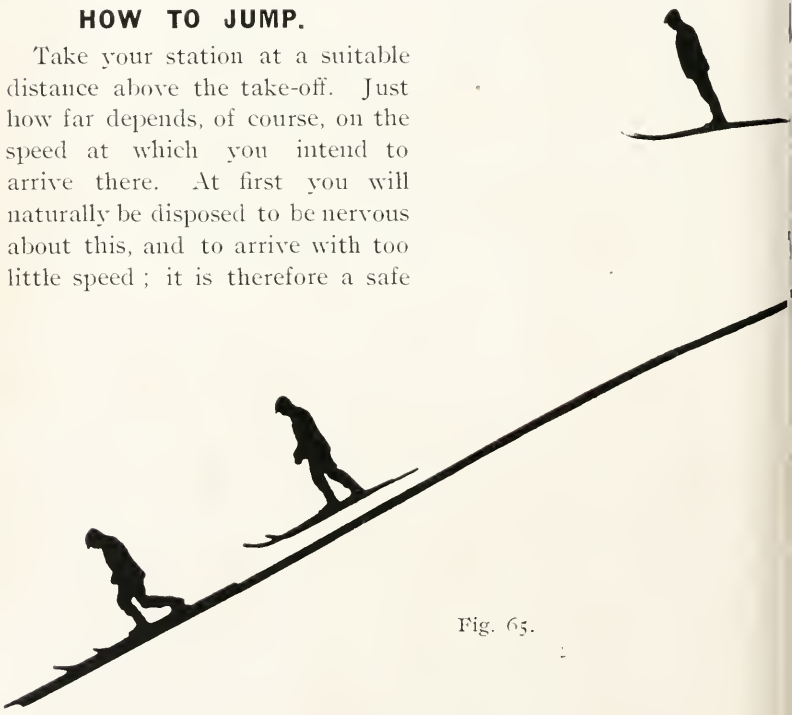


Fig. 65.

rule for a beginner to go just a yard or two further back than he thinks he can manage.

See to it that your binding fits firmly, but not too rigidly, and that there are no lumps of ice or snow adhering to the bottom of the ski to check the speed. Pluck up good courage, determining to stand if possible, and start off in the usual position for descending hills on ski. When within about 15 yards of the edge of the take-off, assume the position shown in Fig. 64; that is to say, crouch *down, bring the feet nearly or quite level, draw back the arms, and let the weight of the body be distributed quite evenly between the balls of both feet.* When within a few yards *of the edge, swing the body and arms evenly forwards, throwing the weight on to the toes, and at the same time straightening up* (see Fig. 65).

This movement is termed the "Sats," and is of vital importance, for on its correct execution everything depends.

Note particularly that no attempt should be made to *lift* the feet as in ordinary jumping. The straightening of the body, if performed vigorously, does indeed cause a slight rising from the ground, but just at first it is best to take things easily. *Unroll* yourself forwards, so to speak, with an easy sweep, avoiding all stiffness and jerking.

The swinging forwards of the arms is an excellent piece of advice which was given to me by a good ski-runner on a jumping-hill, on which I had previously been falling with great regularity; but after adopting it, I stood every time.

Fig. 66.

The exact timing of the Sats is also of great importance. It should be regulated so that the body is just straight as the take-off is left. This, of course means that it must be begun some little distance before the edge is reached, the precise distance of course depending on the speed at which the runner is travelling and the vigour with which he straightens up. Beginners nearly always make the mistake of leaping too late. I once watched carefully two good Norwegian runners who were making leaps of 100 feet and more, leaving the take-off at a great rate of speed. They seemed to me to begin the Sats at least five or six yards before the edge of the take-off was reached.

The extent to which the weight must be thrown forwards on to the toes depends, as we saw above, on the angle which the alighting ground makes with the take-off: assuming the take-off to be horizontal, then the steeper the alighting-ground the more must one come forwards.

In the air the whole body should be erect, and at about right-angles to the alighting-ground. The ski should be held horizontally or thereabouts (see Fig. 65).

A compelling necessity will be felt to wave the arms about in the air, but these movements, though allowable in moderation, are best held under restraint. It is also allowable to look down at the hill below to see where you are

Fig. 67.

about to alight. A calm and easy carriage is the thing to aim at. Shortly before reaching the ground, one ski is advanced a little and the other drawn back (see Fig. 66) and on alighting the knees are bent to relieve the shock. Many good runners throw the *weight right forwards on to the front foot, as though about to make a Telemark swing* (see Fig. 67).

Fig. 68.

As soon as possible, straighten up and finish the rest of the descent in the normal position, stopping on the level with a Telemark or Christiania swing.

Telemark Style.

STYLE.

The foregoing is the style of jumping most widely practiced. It is known as the "Christiania" style, and is chiefly distinguished from the other important style called the "Telemark" by its greater forcefulness, by the swinging forward of the arms when making the Sats, and by the leaper holding his ski horizontally or thereabouts in the air, but *not* pointed downwards to the ground.

In the Telemark style the leaper in making the Sats draws his arms up behind him, as shown in Fig. 68, and rises on his toes, the effect of which is, when he is in the air, to make the ski point downwards

towards the ground. Herr Huitfeldt is the chief advocate of the Telemark style, and in his book he lays great stress on the importance of this pointing downwards of the ski.

The difference between the two styles is probably due to the difference between the jumping-hills near Christiania and in Telemarken. Near Christiania the hills are commonly less steep than in Telemarken, and to make long jumps the take-offs have to be built higher. The alighting is, consequently, rather heavy, as a rule, and it is found safer that the ski should point

Photo by] [*Bernhard Trier*

Fig. 69.

a little upwards rather than downwards. In Telemark, on the other hand, the take-offs are less high, and the leaper relies chiefly on speed and the steepness of the hill to make long jumps. Elegance of carriage is there held in high esteem, and the pointing downwards of the toes is cultivated.

Some leapers, many of whom come from Telemarken, draw their feet up under them in the air (see Fig. 69), presumably with the object (not in my opinion thereby achieved) of lengthening the leap from the "rak" (upright) style. I do not, however, propose to go

further into this, or, indeed, any other niceties of the kind, for the reason stated further on in the chapter on competitions, namely, that style is, to my mind, a secondary consideration, and is of importance only in so far as it conduces to long, standing jumps. The Christiania style may in any case be safely recommended to beginners as conducive to making such.

RECORDS.

Until this year (1909) the longest "standing" jump ever made was that of Nils Gjestvang, who in 1902 covered 41 metres at Modum in Norway. Last year, however, this was beaten by Harald Smith (also a Norwegian), who leapt 45 metres (say 148 feet) at Davos.

One of the finest jumps ever made was that of Leif Berg at Holmenkollen (1909), with 31 metres. At Davos in 1909 Trygve Smith leapt 46 metres but fell.

A COURSE OF PRACTICE FOR BEGINNERS

First Practice.—Before taking your ski onto the snow at all, there is a good deal which you can very usefully accomplish at home, not the least important thing being the fitting of those instruments to your boots. How often has one not seen the beginner struggling with new straps which are too short, punching clumsy holes in them with a gimlet, and not improbably ending by putting his ski on the wrong feet, whilst his friends stamp with cold and impatience, all because he has been too lazy to look to his gear beforehand (!)

Take your new ski boots and stuff them full of paper, or socks, or, better still, a pair of trees encased in a thick sock, and fit them accurately into the bindings. If you are using Huitfeldt's or Ellefsen's fastening, see that the toes are inserted to the right extent between the iron toe-pieces, and that the toe-pieces follow the form of the sole of the boot quite truly ; if they don't, hammer them into place, remembering to leave some space at the tops of the irons to allow for the straps. In the case of Ellefsen's binding, look to the heel-pieces and see that you fit the right binding to the right foot. Make a mark somewhere on the ski, showing which is the right and which the left fastening, so that you will not subsequently have to rack your brains over this harassing question. Buckle the heel-straps on so that the buckles are on the outside of the feet, and see that they can be slipped easily on and off, with the aid of the little strap sewn on to the boot, with-

THE CRITIC. [*Photo by Will Cadby.*

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

out undoing them every time you take off the ski. When all works quite smoothly and easily, practice adjusting the bindings with the boots on your feet.

Kick-turns may also be practiced at home, as described on p. 100, and also the positions for straight-running (see Fig. 45) and snow-ploughing (see Fig. 49).

Photo by [*Will Cadby.*

PROMISING RECRUITS.

Practice the snow-ploughing position with ski on the feet, and learn to turn the toes in and the heels out as far as ever you can.

Second Practice.—Do not make your initial attempt on the snow either during or immediately after a heavy snow-fall, or on a day when it is thawing. Under such conditions of weather

ski-ing is nine times out of ten a pleasure to no-one, and to the beginner it is nothing but a toil and a vexation from which he will learn little or nothing. Begin rather on a bright frosty day, when the snow is crystalline and well settled. Do not let anyone tempt you with sealskin or wax or any such contraptions, but take with you your two good sticks.

Choose for a practice-ground some hillside with a safe outrun onto level ground. It should be for the most part smooth and not too steep (say, about 15 degrees or so), but should also have some places which are a little steeper. A few lumps and bumps will do no harm, nor will a few trees, as it is well from the very first to be accustomed to obstacles.

On this ground you will practice level-running, hill-climbing, kick-turns on the hill-side, and glissading straight downhill, for the greater part of the time with both sticks in your hands; but also, before you are quite tired out, without any sticks. Read the sections dealing with these subjects before going out, and remember especially the following points. For level-running slide as far as possible on either foot, for hill-climbing raise the point of the ski and stamp, for kick-turns turn towards the hill-side and raise the toe and depress the heel of the lower ski before swinging it round, for glissading advance one foot and run on the ball of the other with ski touching each other's sides.

Third Practice.—As soon as you are fairly proficient at glissading, and can stand down steepish slopes without falling every twenty yards (which should be on your second or third day), seek out a road down a moderately steep hill on which the snow has been well trodden down. A toboggan track is admirable for the purpose. Practice straight-running and snow-ploughing on this, and also braking with the sticks, as described (p. 117). For straight-running you may keep the feet level and a little apart, though only a little. Remember to turn the heels well out and the toes well in when snow-ploughing, and to hold the sticks well in front of you when braking. After some practice on the road, return to your moderately steep snow slope and try the same thing there. Practice also glissading *across* a steep slope, keeping the feet level and just a trifle apart.

Fourth Practice.—A short tour, involving a climb of 1,000 feet or so, to be undertaken on the third or fourth day. Take one or two companions and your rucksack, containing lunch, drink of some sort, sweater or other wrap, scraper, and snow-goggles. Should you come across a piece of hard snow on the way up do not forget to half side-step up it, as shown fig. 40 (p. 106), placing the heel of the upper ski well uphill at every step. Lunch in some sunny, quiet spot. After lunch, climb a little higher, and then run down, putting into execution the manœuvres you have already learnt.

Fifth Practice.—Borrow a pair of short grooveless ski, take them to a moderately steep slope, and practice some more snow-ploughing on them, making a curly track facing straight downhill by pressing first on one leg and then on the other. Then go to the steepest slope you can find, and traverse it once or twice in the stemming position (see p. 121).

Sixth Practice.—Same as fifth, but on your ordinary ski. Practice also for a short time the Telemark and Christiania swings, as described (pp. 126-137). Remember particularly, when making the Telemark, to raise the heel of the back ski. Then go to a slope of 18 degrees, or so, on which practice the downhill turn (p. 124). Do not try to make the turn when travelling too fast, and remember to keep the weight well forwards on the outer ski.

Seventh Practice.—A long tour (p. 17). Ascertain from the leader of the proposed party (you will not, of course, dream of going alone) whether he thinks you are up to the work. If he hesitates, don't go ; but if he replies in the affirmative, do not bother to apologize subsequently for any delay you may cause. It was the leader's fault for taking you, and you are in no wise to blame.

In addition to what you took in your rucksack for the short tour, take also your "tin-toe" and repairing outfit, a spare strap or two, the handy tool mentioned (p. 88), some ski wax, and the string arrangement described (p. 85). Do not, however, use this last-named unless you are really *in extremis*. Remember to keep your gloves dry by not wearing the inner covering unless it is really cold. Do not dawdle going uphill, but do not hesitate

to shout to the rest of the party if they are going too fast or too steeply for you. If you should have occasion to take off your ski on a steep slope, take off the upper one first and fix it securely somewhere lest it should bolt away whilst you are engaged with the other. When putting them on again, it is easiest to put one ski onto the upper foot and then to right-about-face and put on the other, which is then also the upper foot. A simple little matter this, but one worth remembering, as it saves a deal of stooping.

Eighth Practice.—Build on the steepest slope you can find a jump with the take-off pointing downhill, and practice on it for an afternoon. Try to stop with Christiania or Telemark swings, and have some independent practice with them after you are too tired to jump any more.

Ninth Practice.—Make up a party and take a short tour, looking out for and going over all the natural jumps you see. Practice mostly on those with up-turned take-offs. Stamp the snow down a little where you expect to alight. This is a most amusing and profitable form of ski-ing, much in vogue in Norway, but all too little known at present to Englishmen.

Tenth Practice.—On a big jumping-hill, after standing on which you are entitled to call yourself a fair ski-runner.

NOTE.—The above is approximately the order in which I think a beginner should arrange his exercises to extend over about three weeks; but, of course, I am far from desirous of laying down any hard and fast rules. I should also like to recommend him to try to pass the Ski Club of Great Britain's Third Class Test as soon as he can, as over and above the stimulus which a test affords to practice, his badge, when he has won it, will act as a passport to any tour of reasonable length, undertaken by any body of English ski-runners.

We ski-runners are wont to boast not only that our sport is the finest in the world, but also that it is pursued amidst the most beautiful of natural surroundings. I do not know how far as regards the first of the contentions we may be supported by the testimony of unbiassed witnesses ; but as regards the second, we are backed by the authority of one who was no mean judge of beauty, but who, so far as I am aware, was himself no ski-runner. "In the range of inorganic nature," writes Ruskin, "I doubt if any object can be found more perfectly beautiful than a fresh, deep snow-drift, seen under warm light. Its curves are of inconceivable perfection and changefulness ; its surface and transparency alike exquisite ; its light and shade of inexhaustible variety and inimitable finish. The shadows sharp, pale, and of heavenly colour. The reflected lights intense and multitudinous, and mingled with the sweet occurrences of transmitted light. No mortal hand can approach the majesty and loveliness of it. . . ."

But it is not enough for us to love these beauties of form and colour which are presented to us more frequently than to other mortals. We must also, like the artist, learn to understand something of the nature of our medium and to make allowances for its peculiar and changeable character. For snow is an ever-varying substance. Thus and thus it is to-day, and thus and thus it will be to-morrow, ever restless, ever unstable. It is never content to remain the same, but is always (alas, in this country too often !) trying to turn itself into water, or into ice, or into vapour, and also it has a habit of attracting to itself

dew, and of turning that into ice, all of which peculiarities concern us, if for no other reason than because on an understanding of them depends both the quality of our sport and sometimes also our safety in the enjoyment of it. The best way of treating the subject will, I think, be to consider two kinds of snow, viz., new snow and old snow, premising, of course, that there is really no hard and fast line between the two, and that the classification is for convenience' sake only.

New Snow.

As the reader is doubtless aware, snow in no way really resembles the paper which heralds the approach of the unhappy heroine in the melodrama, nor is it really at all like the cotton wool which does duty for it on Christmas trees; but it is composed

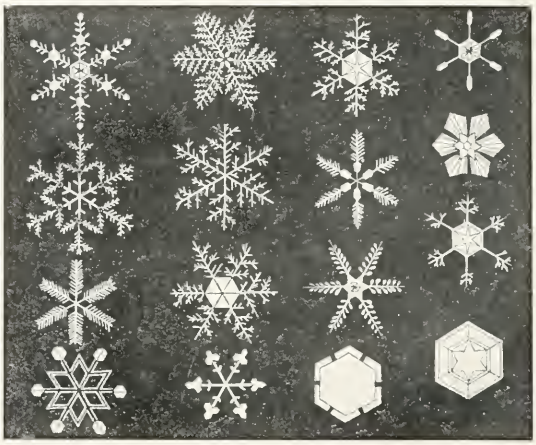

Fig 70.

of myriads of minute ice crystals. These may be seen clearly with the naked eye during a fall of snow against any dark background, such as the sleeve of one's coat. They are delicate, beautiful little things, and vary as regards the details of their construction; but in principle they are all hexagonal in form, and appear for the most part like little six-rayed stars (see Fig. 70).

When the temperature is about freezing point, as it often is during a snowfall, these little stars cling together in the air and form the big flakes with which we are all familiar ; but when it is freezing hard, they are not so liable to do so, and the flakes are smaller. On reaching the ground, when the air is still, the rays of the stars lie criss-cross over one another, and so include between them innumerable air spaces. New snow is thus apt to be very loose in consistency, and when it is at all deep, the ski sink a long way into it, and progress is hard work. The evil is almost invariably aggravated by the tendency which new snow has to stick to the ski. This is caused partly by the fact noted above, that the temperature during a new fall is often high, and, consequently, the snow is often in a semi-melting condition, and also, I think, because the little snow stars are like so many tiny burrs, and are only too anxious to stick to anything they come across. This last supposition, at all events, accounts for the fact that even high up, where the temperature may be very low and the snow in consequence quite powdery, there is always a tendency for new snow to stick. When the sun comes out after a fresh snowfall, the sticking nuisance is apt to be most tiresome ; for the snow, being in a state of such fine sub-division, is very easily melted. The remedy for sticky snow is, as we saw (p. 86), wax ; but a good deal can also be done by giving the ski a brisk rub through the snow when bringing them forward at every step, and by lifting the feet as little as possible. A beginner who plods along much as he would walk on foot will frequently attract to his ski masses of snow, while a more experienced runner will slide along comfortably on perfectly clean surfaces. But all things considered, touring in deep, new, undisturbed snow is a laborious proceeding, and since, as we shall see by and by, it is apt on steep slopes to be highly dangerous, the beginner will appreciate the force of the advice previously given to leave it alone.

The best thing to be done immediately after a fresh snowfall is, unquestionably, to repair to the jumping-hill. There the snow may soon be trodden down, and if it should still stick, one may wax to one's heart's content, and after each leap take off the ski, shoulder them, and walk up the hill on foot. A party of leapers

soon makes for itself an admirable footpath. It is also worthy of note that, even supposing the snow should be somewhat sticky for a time on the jumping-hill, if the temperature should fall a trifle (as it nearly always does *after* a snowfall), capital sport will at once be enjoyed.

At one ski meeting in Switzerland, which I attended, when we awoke in the morning it was pouring with rain, later on the rain turned to snow, which, however, was very soft and sticky when we reached the jumping-hill. But presently it cleared up, turned cold, and everything went off capitally, save for the absence of a few competitors who had previously gone home in disgust.

But whilst a large quantity of new snow is always bad for touring, a sprinkling of an inch or two may do no harm, especially if the snow falls fine and dry, and if it has had just a little wind to help it to pack. Under such conditions the ski do not sink too deeply, and the slight degree of sticking enables one to climb steeply uphill, but is not sufficient to interfere with one's passage downwards, when the friction keeps the ski clear. If, however, the new fall should have been very slight, or if it has been much blown about by wind, it is necessary to exercise caution when glissading, as one is then apt to come across patches of old snow across which the ski will fly at a great speed, and patches of new snow in which they will be checked, with the result that the runner is pitched suddenly forwards. On a dull day, when the snow and the sky present one even aspect of grey, it is difficult to distinguish the patches ; but when the sky is blue and the sun is out the old snow is always darker in appearance than the new, and it is then easy enough to make allowances by leaning backwards when the new patches are encountered. When running thus it is also well to stoop down and crouch on the ski, as one is then less likely to be pitched forwards.

When new snow is blown hard against a smooth hillside, much of it does not, in fact, remain there at all, but settles on the sheltered side of the slope or in the gullies and crannies where there is no wind. Nevertheless, in the course of time a layer of snow does form on the exposed weather side, and also, of course, on those parts which lie between the strict

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SNOW WREATHS. [*Photo by Will Cadby.*

weather side and where a certain amount of wind also prevails. This layer, in which the tiny ice crystals are packed together, and which varies in thickness, somewhat resembles, both in appearance and consistency, the sugar crust with which bakers are wont to cover bridecake. It also resembles such a crust in that it often does not adhere quite closely to its support, but is apt to break away in slabs. As we shall see presently, when we come to treat of avalanches, this is a very dangerous condition on steep slopes. On moderate slopes, too, it is necessary to be cautious on such snow, as the ski, especially when edged as in traversing, are apt to cut through the crust on some places and to skid on it in others. This is, of course, less likely to happen when standing straight downhill, and if that method of covering the ground is feasible, it is the best way of overcoming the difficulty ; but otherwise there is nothing for it but slow and careful running. It should be added here that crusts of this kind are often formed not only by new snow which falls directly from the sky, but also by old snow which a strong wind may blow off the mountain tops.

Wind-driven snow, when it strikes the ridge of a mountain, forms there a projecting ledge or " cornice." See the photograph (p. 182). The cornice is sometimes small and projects for a short distance only, but sometimes it is large and formidable, and projects for a number of yards. From the slope below the overhanging ridge the treacherous nature of the formation is evident, but to a ski-runner who is climbing up the other side the danger may very well be concealed till, when near the top, the whole mass breaks beneath his weight. Accidents of a fatal nature have often been caused in this way, nor have they been confined to the wholly ignorant, but have often befallen experienced mountaineers. Quite a small, insignificant-looking cornice is sufficient to bury a man ; and if, as often happens, the weight of the falling mass starts an avalanche on the slope below, the case is well-nigh hopeless. It is also to be noted that cornices are not always so obliging as to break off on the true ridge of the mountain. I once stood on the ridge of a mountain with a party of other donkeys. We thought it

would be fun to stamp about and break off the cornice and see it go rolling down. For some time our efforts were unsuccessful, when suddenly there came the well-known " r-r-room," and we then perceived that although we were standing on what we considered to be perfectly safe ground, the snow had cracked under-

Photo by] [*H. Hoek.*

A Cornice.

neath our very feet. Luckily for us, it did not break just there, but on either side of us, for a distance of 100 yards or so each way, large masses detached themselves, and falling onto the ground below started off two of those harmless-looking snow-slides which have caused the death of so many tourists. Since then I have been very polite to cornices, and have kept away from them as much as possible.

Old Snow.

When snow lies for some time undisturbed by rain or sun, its own weight causes it gradually to settle. This process is also favoured by the changes of temperature to which it may be exposed, and which cause it to contract and expand. I do not know whether anyone has ever measured the extent of such settling, but I should think that when a heavy fall is succeeded by

Photo by] [*E. C. R.*

ICE FLOWERS.

a night's hard frost, the snow will in the course of the night settle so that next morning the depth will be about two-thirds of what it was the day before, and the process will afterwards continue in a gradually diminishing ratio. In this way, in the course of a day or two the fluffy, powdery, new snow is converted into a fairly firm and compact substance, into which the ski will sink to the depth of an inch or two only.

In the meanwhile, also, another process will have been at work.

This is the condensation of dew in the form of "hoar-frost" which occurs both on the surface of the snow and also on the surface of ice. The hoar-frost on the surface of snow forms in the shape of thin flat crystals, which, from a tiny beginning, night after night increase in size. I do not know how big they may eventually grow, but after a long spell of fine weather I have often seen them measuring at least three inches across. These hoar frost crystals be they big or small, are a joy and a blessing to the ski-runner, for over them the ski slide splendidly. This is indeed the best and, fortunately, also the commonest condition of snow, and all that need further be said is that the firmer the under-snow and the bigger the hoar-frost crystals, the better.

The settling of new-fallen snow is, of course, accelerated by sunshine. Strong sunshine is obviously undesirable, as it melts the surface, causing the snow to "stick"; but a little sunshine, especially after a day or two, when the hoar-frost crystals begin to grow large, does no harm.

Snow which has been melted during the day by the sun will freeze again at night, and in this way a crust of ice is formed on the surface. This is a bad thing for ski-ing, especially if the crust be just thick enough in some places to support the runner and just thin enough in others to break under his weight. Great care should be exercised when running under such conditions, for a fall will not only cut the face and hands, but the ski are liable to catch in the crust and cause an accident.

I was once staying at an hotel in Norway, around which the snow was in this treacherous state, and in the evening I complained about it to a Norwegian who was sitting next to me in the smoking-room. "Ah," he said, "it is a ski-runner's business to understand all these differences in the snow and to make allowance for them. Here in Norway, when we come across snow like that we hold ourselves in readiness, and when the crust breaks we lean well backwards and so are not flung forwards on to our faces, as I see has happened to you." From these observations (I have, of course, forgotten the exact words, but the above was their purport) I perceived that my friend belonged

to that class of Norwegian who supposes that, however much a foreigner may study ski-ing, he can never really know much about it, just as some Englishmen suppose an inherent incapacity in all other nations for football and cricket. I accordingly humbled myself and said that I had not thought of that way of overcoming the difficulty, and begged him to give me a lesson on the following day, a proposal to which he readily assented. Next morning, accordingly, we set off, my friend leading the way in great style with a pair of new ski. Presently we came to a hill on which I knew the snow to be treacherous, but down which my instructor started off apparently without any misgivings. About half-way down there occurred just what I had expected. The crust suddenly broke, and after a somersault or two he came to rest. He was unhurt save for a few scratches, but one of his beautiful new ski had broken off short at the bend. I condoled with him on his bad luck and offered to return home to fetch him another ski, after which I suggested we might continue the lesson. But though he consented to the former of these propositions, the latter did not find favour in his eyes, and on my re-appearance he returned home a sadder and perhaps a wiser man.

When the crust formed by the melting and re-freezing of the surface is thick enough to bear the runner, matters are, of course, not so bad ; and if the ground be not too steep, ski-ing under such conditions is amusing enough. The Christiania swing is very easy, and once the knack is learnt on hard ground its execution becomes less difficult when the snow is softer. Sometimes, too, it happens that a general thaw is succeeded by a hard frost, and then, after a night or two, a deposit of hoar-frost crystals forms on the surface of the crust, which again affords good going. In general, however, crusted snow is hard work, both uphill and down, for the ski will not bite properly on it.

Snow may also be packed very hard indeed, almost to the consistency of ice, by the prolonged action of wind. In the course of this process a series of wave-like ridges often forms on the surface, and these gradually increase in height. On the Norwegian and Swedish *fjaelds* this is a very common state of affairs, and a very awkward one, for the waves are sometimes a foot or two

in height and are very shaking and disturbing to the balance, as well as a danger to the points of the ski. This kind of snow is less common in Switzerland, though it at times occurs high up, even in places where one does not expect it. I remember once being cheated out of a lovely run down a Swiss glacier by the presence of this wretched "skavler," as it is called in the expressive Norse tongue.

There is yet another kind of old snow deserving of mention. It occurs in the spring of the year, when the snow is thoroughly wet and disintegrated, and somewhat resembles damp salt. When in this state it does not cling to the bottom of the ski. I have met men who have assured me that in their opinion skiing in this kind of stuff was entirely delightful, but either they have exaggerated or my experience of it has been unfortunate, for, personally, I have always found it slow and unpleasant. Maybe it is like autumn salmon fishing, which is perhaps just a little better than no salmon fishing; but, for me, to compare the heavy salt-like snow of April with the light, dry, rustling crystals of January, is like comparing an old end-of-the-season kipper with a flashing springer straight from the sea.

Miscellaneous Hints.

1. When bad snow is encountered, keep your eyes open and look for a better course.

2. The snow on slopes facing south is apt to be either sticky or hard, according as it is new or old.

3. Soft snow on southern slopes is best crossed early in the morning or in the evening.

4. Very hard snow on southern slopes may be crossed about midday, the slight softening from the sun will be a help and the snow will not stick.

5. Really old snow sticks less on a hot day when it is quite wet than when it is half-and-half.

6. Northern slopes are usually best for the run-down as the snow on them is less likely to be affected by the sun.

7. In January in Central Europe one need not bother much

about south and north slopes, nor, commonly in Scandinavia, till March.

8. Snow in woods is often deep and soft, whilst a few yards above, on the hillside, it may be quite firm.

9. Remember that the margin between sticky snow and non-sticky snow is a narrow one, and that a slight drop in temperature may put matters right.

10. Still, there are times when the snow sticks so badly that nothing one can do will get rid of the heavy masses which persist in clinging all over the ski. "It may be counted to our credit if in these very bitter moments silence descends upon us, and we preserve outward appearances." *

Photo by] ON THE FELDBERG. [*Dr. Hoek.*

* Sir Edward Grey: "Fly-Fishing."

General Remarks.

AVALANCHES occur when the snow slides off a mountain-side just as during a heavy snowfall or during a thaw you may see it slide off the roof of a house. In order to understand the causes of the phenomenon, it is well to consider why snow rests on a mountain-side at all, and why it does not slide off at once like water.

The chief reason, of course, is the friction caused by the particles of snow against one another and against stones, trees, etc., etc.; another reason is the support which is afforded to the snow which is high up on the slope by that which rests below it on level ground; and a third reason is the actual cohesion of the particles of snow to one another, which occurs, always to some extent, but to a greater degree if the snow is damp or if it is frozen or wind-driven into a crust. The support which a mass of snow on a hillside gains from such cohesion is obviously, unless the crust be very thick, of a slender nature, and only comes into play when, but for it, the friction would be insufficient to hold the snow in place. The support rendered by the base of the column of snow is evidently also of a fragile character and depends largely on the length of the hill, just as a column of six pennies one on top of another is not easily upset, but a column of one hundred topples over on the slightest touch.

It is very important to thoroughly appreciate just how the

snow hangs on an avalanche slope, so, at the risk of being tedious, I will give another illustration. Suppose that you had to lift a heavy weight by means of silk threads. One thread would not suffice, nor would two, nor three or four, but if you keep on adding threads one by one in this way, there would come a time when at last, by the addition of a single extra thread, you could lift the whole weight. The weight would then in a sense be hanging by a single thread, which the addition of a trifling extra strain would suffice to break.

Now this is precisely what happens in the case of an avalanche. A mass of snow lies on a mountain-side, supported, as it were, by a large number of threads in the shape of the friction against rocks, trees, etc., and also by a few single threads in the shape of support afforded by the base of snow resting on the level or by the stickiness of the snow, or both. Then comes the trifling extra weight in the shape of a falling cornice, or of a ski-runner, or sometimes even of a vibration of the air caused by the cracking of a sleigh-driver's whip, which breaks the slender bond and sets the whole mass suddenly in motion.

In this way certainly the great majority of avalanches arise. The popular conception, however, is different. It is commonly supposed that avalanches start by a small quantity of snow, disturbed, possibly, by the wind, beginning to trickle or roll downhill, and by the stream *gradually* increasing in volume till it turns into a mighty torrent bearing all before it. This is certainly the appearance which an avalanche presents when flowing down a steep gully ; but whilst a small avalanche once started may gain volume by a series of other breaks succeeding one another in more or less quick succession, and whilst the original break may perhaps sometimes be caused by a trickle of snow, the basis of the theory—that of the gradually augmenting trickle —is, I think, erroneous.

I have been in one avalanche, have seen several, and have examined the starting-place of a great many. In all cases their sudden origin has been apparent from the sharp, clean break in the snow which has marked their starting-place, and in each case which I have witnessed a considerable field of snow has

set itself in motion at once. On the other hand, I have frequently tried to test the trickle theory on short, very steep slopes ; but when the snow is dry the trickles which I have set agoing, so far from increasing in volume, diminish very rapidly and soon cease altogether ; whilst in sticky wet snow a big snowball soon splits into pieces and comes to a standstill. I think, therefore, that it may be safely assumed that all avalanches start by a sudden

Photo by] [*E. C. R.*

THE AVALANCHE WHICH WRECKED THE FIRST PARSENN HUT.

Wreck of hut near middle of picture. Note the line of breakage at top.

rending asunder of the snow caused by the breakage of the slender supports previously mentioned.

It is certainly the exception and not the rule for accidents to occur through avalanches sweeping down on the top of ski-runners. Much more frequently it is the actual snow on which they are standing which first sets itself in motion, and *there can thus seldom or never be any talk of avoiding an avalanche by turning downhill and fleeing before it.*

Which being established as regards avalanches in general, we may now proceed to deal with them more in detail.

Avalanches may be divided into three classes, viz., old, wet snow avalanches, soft, new snow avalanches, and crusted snow avalanches. Each of these will be dealt with in turn, after which we shall return to some further consideration of a general nature, which we shall then be in a better position to understand.

Old Wet Snow Avalanches.

Under this heading fall what the Germans and Swiss call "Grundlawinen"; that is to say, those big avalanches which occur in the spring time, and which extend to the ground, leaving the hillside on which they occur quite bare of snow. The title is, however, misleading, as it seems to imply that other avalanches do not extend to the ground; whereas many, in fact, do so, and also that "Grundlawinen" always extend to the ground, whereas, as a matter of fact, they do not necessarily do so.

Old wet snow avalanches occur when the snow is soaked through either by rain or by surface melting. The water so formed gradually increases the specific gravity of the mass, and at the same time saps away the bonds which hold it to the ground below. The process continues till the snow is held in place by the cohesion of its particles only. Then, perchance by the falling of a stone, this slender tie is broken, and the whole mass descends with a mighty roar to the valley below.

Though the largest and most formidable in weight and appearance, avalanches of this kind are perhaps the least dangerous, for the reason that they occur in much the same places every year, and their track, being usually well known, can easily be avoided. Nor are they of much interest to the ski-runner, who is not likely to be about when they fall.

Soft New Snow Avalanches

may and do occur most irregularly, and their course can seldom be foretold. Let us consider how they are formed.

The new snow slowly piles itself up flake by flake on the hillside, growing ever deeper and deeper and heavier and heavier, till presently the stage arrives when the friction against the ground is alone insufficient to hold it in place. The precise point at

which this stage is reached evidently depends on (1) the steepness of the ground, and (2) on the degree of roughness of the ground. It is said that all hills below 23 degrees are safe, and as far as I know this may be accepted as true. Smooth grass slopes and also *old crusted snow on which new snow falls* soon become dangerous. Rocky slopes, such as occur on mountain-sides, will hold a great deal of snow, provided, of course, that the rocks are really called into play and are not too far submerged below the surface. Too much reliance should not be placed on little trees and scrub, as I have several times seen snow slide over them ; but thickly-grown pine forests may, I think, be considered safe up to any degree of steepness. I have indeed seen a track made by a soft snow avalanche which went straight through a thick pine forest, but in that case I am fairly certain that the avalanche started above the tree level.

The snow does not, however, begin to slide so soon as the friction against the ground is insufficient to keep it in place ; for, as we saw above, on short slopes considerable support is gained from the snow resting at the bottom of the hill. It is impossible to say just what reliance may be placed on this, but open slopes of 200 yards in length are certainly more dangerous than slopes of 100 yards or so. It is also very important to note that this sort of support entirely disappears when, instead of ending on the level, the hill suddenly takes a steeper dip, as, for

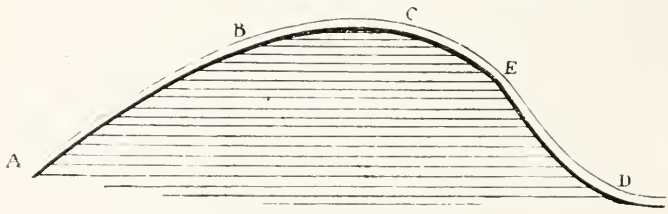


Fig. 71.

instance, when it runs into a water-course. Fig. 71 shows what is meant. It represents the section of a mountain with a snow covering over it, of course on an exaggerated scale. The side A B may be safe all over, but the side C D may be dangerous

between C and E, on account of the sudden dip E D. It is also to be observed that the support which new snow gains from the column below it is not great, for new snow has much air in it, and is, consequently, weak and unstable. The legs of the colossus are, so to speak, of clay.

There remains to be considered the cohesion between the particles of the soft new snow, which constitutes, as it were, the

An Avalanche in Motion.

last threads by which a mass of snow may be held in position. If the snow has fallen wet these bonds are, of course, stronger than if it has fallen dry, but, on the other hand, the increased specific gravity of the snow correspondingly increases its liability to slide. The consequence of this is that wet new-fallen snow is probably the most dangerous of all kinds, and if it were not for the fact that ski-ing on it is so difficult and unpleasant, the

proportion of accidents arising therefrom would probably be greater than they are.

In the case of dry fallen snow, the support gained from adhesion must, of course, be but slight; but that it exists to some extent is, I think, shown by the sharp clean break which avalanches so composed show at their starting-point. Dry snow avalanches of this kind are called in German "Stanblawinen," from the vast clouds of snow-dust which they cast into the air in their course. But here again the terminology is a little misleading, as it seems to imply that the avalanche itself is in some way composed of snow-dust. It is, however, safe to assume that nature never really indulges in this form of blank cartridge, and that below the dust large masses of snow are in motion along the ground. A peculiarity of this form of avalanche is also said to be the strong rush of air which accompanies it, but that is, I believe, common to all avalanches when of sufficient size.

A Swiss sleigh-driver once told me that he and his sleigh and horses had been blown many yards through the air by the violent tornado which accompanied a soft new snow avalanche, though the avalanche itself passed at some little distance from him.

It is, of course, impossible to draw any hard and fast line between old and new snow. All that one can do is to say that the longer the snow has been down the less likely it is to slide. On the other hand, snow which rests on an old crust or on specially slippery ground, should *always* be viewed with a certain amount of distrust. I have not, however, thought it advisable to include *old* soft snow avalanches in the classification, as, though they may occur, I have no knowledge of them.

Crusted Snow Avalanches.

We saw in the previous chapter that snow, when driven by wind, forms itself into a crust which we compared to the sugar on a bride-cake. This crust, even when so hard that the ski do not break through it, or only do so in places, is on steep slopes most dangerous, and has caused a large number of avalanches, which have ended fatally to ski-runners. The danger is the greater both because the snow, being hard, gives a false impression of security, and

because the condition does not seem to occur in summer, and is, consequently, unknown to many otherwise experienced guides and amateurs.

Another treacherous feature of this kind of avalanche is the fact that it may occur some days at least *after* a snowfall, though whether in such cases the crust itself is new or whether it has

Photo by] [*H. Hoek.*

CRUSTED SNOW AVALANCHE.

been newly formed by old wind-driven snow, must be regarded as doubtful.

And yet another source of danger is the fact that such an avalanche may occur even when the temperature is low; that is to say, when snow is usually considered to be safe. What happens is that the snow cracks suddenly across a greater or less portion of its area and descends in large slabs, which tear along with them part or all of the loose snow below. The slabs somewhat resemble paving stones, or boards, whence the Teutonic

name for this kind of avalanche is appropriately "Schneebrett."

Just why crusted snow of this kind should be so liable to slide is not, I believe, thoroughly understood. But it may be surmised that one at least of the causes is the contraction and expansion of ice, whereby the crust may at one time be in a state of tension and at another in a state of compression. In both cases it will be strained and liable to break.

Dr. Hoek mentions in this connection that both he and Dr. J. Clark have observed an actual embossment of the snow. The phenomenon somewhat resembled the crust of a pie. Underneath was a quantity of loose, dry snow, which ran out when the crust was broken.

Unlike other avalanches, the Schneebret often occurs on quite a miniature scale; hence, yet another source of danger, for it is apt to be assumed that because it is *usually* small and harmless it is always so.

More Generalities.

We are now in a position to consider the subject of avalanches in general a little more closely.

It will have been observed that the time of greatest danger for the ski-runner is when the weather, and consequently also the snow, is unsettled; that is to say, either during or after a heavy fall, or when there is much wind, or when there is a change from cold weather to a thaw. The warm wind known on the Continent as the *Föhn*, which often brings with it snow, and during which it is often milder high up in the mountains than below in the valleys, is a sure sign that avalanches may be expected; and whilst it lasts the ski-runner should keep well away from all steep, open slopes.

On the other hand, when the weather is settled—that is to say, after two or three days of bright sunshine, succeeded by nights of hard frost—I think that the snow may be taken to be safe, *provided that it is of even consistency throughout, and does not rest on a specially slippery support, such as an old snow crust, a slippery grass slope, etc.* In fine weather the snow settles down, partly owing to its own weight and partly owing to the contracting

and expanding to which it is exposed by changes of the temperature. During this process most slopes on which the snow hangs dubiously will (if one may use the expression) have made up their minds one way or the other—either they will have settled down or else they will have avalanched. Thus, though one hesitates to lay down hard and fast rules in so dangerous a matter, I think it may fairly be assumed that the presence of the sugar-like crystals of hoar-frost on a slope affords a strong presumption of its safety, and if, on testing such a slope with a stick, the snow be found to be of even consistency throughout, and not to rest on an old crust, and if the stick indicates that the ground below is rocky, I think the slope may be trusted. At all events, I have many a time crossed in safety such sugary slopes, which would at other times certainly have slipped.

It also stands to reason that crusted snow will also usually have declared itself one way or the other, after a spell of still, settled weather ; that is to say, either the crust will have slid off or else it will be strong enough to bear ; and here again the even consistency of the snow throughout as indicated by probing with the stick is the best test of safety.

These conditions of safety may strike the inexperienced as demanding a great deal, but those who know the mountains will agree that fortunately they are common—if it were not so, skiing in the Alps would be little better than suicide. Indeed, my only fear is that the conditions may be too lax. Accordingly, I should like to recommend my own practice to the reader ; that is to say, I advise him to exercise caution when crossing *all* very steep open ground. Long slopes over 30 degrees should, I think, *always* be crossed one at a time, the most experienced ski-runner of the party leading the way, for a slope which will bear the weight of one man may not necessarily bear the weight of an entire party, besides which, if an accident should occur, the rest of the party will then be in a position to render aid.

It has been suggested that when a really dangerous slope has to be crossed, the leader should drag behind him a piece of coloured tape whereby he may the more easily be found if the snow should

slip. The plan may perhaps be of service if the tape is thick enough not to break, but one hesitates to advocate anything of this sort, which adds to the gear one has to carry, and which might at the same time encourage a sense of false security. Possibly, however, the cord arrangement described on p. 85 might be dyed red and used at a pinch when the crossing of dangerous ground is a necessity, as, for instance, if the weather were suddenly to change during a long tour.

When a dangerous-looking slope has to be traversed, it is customary to cross it after the manner of the chamois ; that is to say, as high up as possible ; for the reason that if the snow breaks one may keep on the surface and may not be overwhelmed by snow falling on the top of one.

Whether the ski should be taken off on a doubtful slope is a moot point. Probably it is best to do so, for though the snow may thus be cut rather more through, still, if it should slip one is less likely to be dragged under, as happens with ski on the feet. A good plan might be to cross such a slope with the bindings loose, so that the feet could, in the event of an accident, easily be freed from the ski.

When treating of this subject most text-books recommend that if one has to climb a very steep, dangerous slope, it is best to do so straight up on foot to prevent cutting through the slope by traversing on ski ; but the occasions on which this is necessary must be rare. Usually there must be some less steep way up, or else some friendly rocks to make for.

We noted above (p. 192) that slopes on which the gradient took a sudden dip were specially dangerous, and it should be added that if the slope narrows down instead of broadening out towards its base, the peril is increased, for then one is liable to be crushed by the snow packing together in the funnel so formed. The same sort of thing also happens when the slope which slides has immediately opposite it another steep slope.

A dangerous slope sometimes proclaims itself by a cracking of the snow and a booming noise not unlike that of ice cracking on a lake. These are, however, by no means invariable concomitants of danger, for they often occur on quite gentle slopes

and even on the level. On steep ground, however, the warning should not be disregarded.

While scarcely anyone is so foolhardy as knowingly to risk his life on an avalanche slope, the number of people who do so unknowingly is by no means inconsiderable. The dangers which attend ski-ing on steep ground in doubtful weather are indeed much more serious and much more frequently present than most people seem to imagine. It is no exaggeration to say that amongst English ski-runners there is at present a very high percentage who could not be induced to run the almost nominal danger of leaping from a big jumping-hill, but who not infrequently through sheer ignorance risk their lives when making mountain tours. The danger to life from avalanches, it must here be emphasized, is not some remote thing with which the majority have no concern, but a factor in the sport which has to be understood and reckoned with constantly. Few, indeed, are those who have acted as pioneers of ski-ing in Central Europe who have not had some personal experience of the kind. Usually these affairs are unaccompanied by serious result, but sometimes they end with a broken ski or a twisted limb, and sometimes, alas ! fatally. Nor have the victims of such accidents been in all cases men without previous mountaineering experience ; on the contrary, many have been skilled summer climbers who rashly assumed that the conditions in the Alps were the same throughout all the year. *The reader, therefore, should on no account place implicit trust either in professional guides or amateurs whose experience is limited to summer climbing.* For, not improbably, they have but little knowledge of snow, their work for the most part being on rocks or ice, with which the ski-runner, as such, has no concern. There is, or perhaps one should say there was, a tendency on the part of some mountaineers to under-rate the dangers of the winter snow, and to assume that because you can drive a cow over such and such a pass in summer, that, therefore it is always safe in winter too. It is well to beware of such blind guides ; and if no experienced winter companion is available, to trust to maps and to one's own commonsense, aided, if I may say so without presumption, by the foregoing advice.

An Example.

In conclusion, as concrete instances convey more to most people than a deal of generalities, I propose to give one. It occurred to myself and my brother, and ended without injury.

It was the first winter which we spent at Davos. Our previous experience of ski-ing had been two winters spent in Norway, for the most part in the neighbourhood of Christiania. We had had

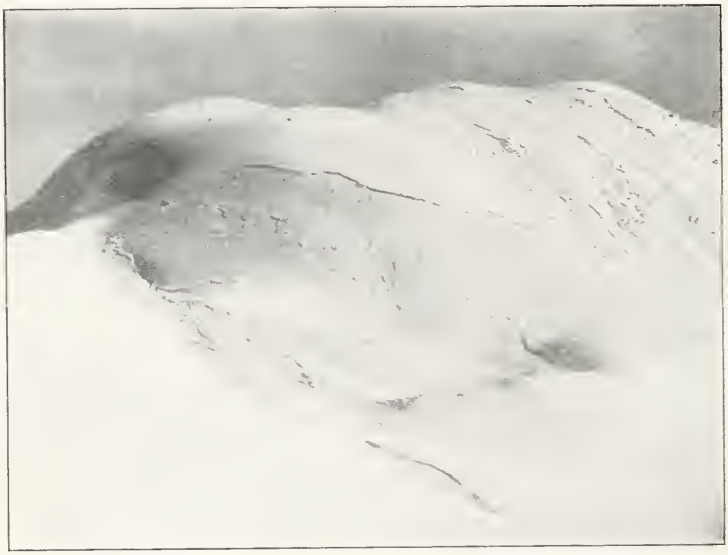


Photo by] [*E. C. R.*

AN AVALANCHE ON THE BREMENBÜHL.

Note the sharp break. The proper way up is past the break on the left side of the avalanche. We tried to ascend on the right.

no previous experience of the Alps, either in summer or winter. At that time we were almost the only ski-runners in the place, and an expedition up the Strela Pass, which is now a regular practice ground for beginners, was considered a considerable achievement.

Opposite Davos rises a rounded summit some 3,000 feet or so above the valley, called the Bremenbühl, which looks and is a fine ski-ing mountain. We decided to climb it. We had heard

vaguely of avalanches before then, but any conception we had of them at that time was the popular one ; that is to say, a big shower of snow and stones rattling down from above, caused we knew not how. The possibility of our tour being attended by danger from any such a source never once entered our minds. There was the white dome before us, and all that was required to get to the top was energy and perseverance.

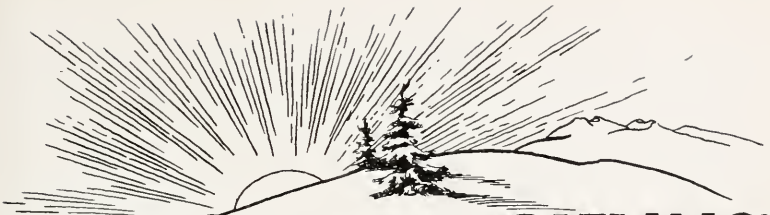
So we started off on such and such a day on which the *föhn* wind was blowing, immediately after a heavy fall of snow. Neither of us would dream of doing such a thing now, but at that time one day was as good as another to us ; we knew very little about new snow and nothing about *föhn* winds, and if the snow was heavy in the valley we thought that very likely it would be better higher up.

Our expectations in this respect were not fulfilled, for when after a stiff climb we arrived above the tree line the snow stuck to the ski grievously, and we sank in deeply at every step. We did not follow any particular way, but took the course of least resistance, which, after a lot of work, landed us at the foot of a long steep slope leading to the top. We were, in fact, on the eastern side of the sort of big cauldron formed by the hills leading round from the Bremenbühl to the Jacobshorn. The ground on which we were standing was fairly level, and after a short rest we started off again, anticipating that a long traverse or two would bring us to the ridge. After about a quarter of an hour's hard toil we were about half-way up, I being in front and my brother some little distance behind and above me. The ground grew steeper and steeper, but it never once occurred to us that we were in a dangerous place. Suddenly there came a loud, dull report, something like the cracking of ice on a large lake, and before we realized what had happened we found ourselves on our backs with masses of snow surging about us. After a while the part of the avalanche in which I was embedded stopped, but it soon started off again.

After a further slide of fifty yards or so, during which I remember that my sensations were of anger at the big, senseless slabs of snow from which I could not free myself, the avalanche finally

came to rest. I was buried right up to my neck, and had my journey continued a few yards further I would certainly have been submerged completely, and, in all probability, killed. Moreover, had the bottom of the hill ended in a narrow gorge, or had there been an opposing slope near to it, the snow would certainly have crushed me to death. As it was, I had a good deal of difficulty in getting out, and doubt whether I could have done so alone; but, fortunately, my brother, who at the time of the slip was higher up the slope, extricated himself fairly easily, and came to my assistance. Our casualties amounted only to the loss of a ski stick, and we both felt that we had been let off very easily. After we had recovered ourselves a little we climbed up the slope, which was now bare of snow, thinking that perhaps we might be able to get to the top after all; but some little distance below the ridge we came to a barrier in the shape of a wall of snow about a yard and a-half high, which marked the place where the avalanche had started. As the barrier looked as if parts of it might at any moment break loose, and as all the rest of the slope seemed just as steep and hopeless as that we had climbed, we decided that we had better give up the Bremenbühl for that day anyhow, and so we turned back and ran down to Clavadel.

I may perhaps add that both of us have often been up the mountain since, and that under favourable conditions it is perfectly easy and safe.



SOME SKI-ING COUNTRIES

British Isles.

THE opportunities for ski-ing in this country are far more frequent than most people imagine. The Welsh and Scottish mountains are often covered with snow for many weeks, and even months, at a time, and of lower-lying ground the Peak District in Derbyshire and the country around Sedbergh in Yorkshire, may be mentioned as being especially favourable. Parties of ski-runners are now to be found in these parts of the country after every snowfall throughout the winter, and the sport enjoyed is often of a very high order. People who have visited Continental ski-ing resorts are apt to imagine that because the snow which falls in our towns is wet and sooty, that therefore it is the same everywhere in the British Isles; but, needless to say, this is not the case. The snow on our mountains is really neither better nor worse than elsewhere, but just the same, provided, of course, that it is freezing.

The Highlands of Scotland are very suitable for ski-ing, and if there is sufficient snow, no one could desire a better country than that in the neighbourhood of towns like Kingussie, Newtonmore, or Dalwhinnie, which are within a comfortable night's journey of London.

The hotel-keepers in these places are quite accustomed to ski-runners, and are always ready at the shortest notice to cater for their requirements. The hotels themselves are comfortable and the prices reasonable.

I am, however, inclined to think that ski-ing in the British Isles is not likely to be attractive enough to induce those who have a fortnight or three weeks' holiday at their disposal to spend it at home. Such people naturally desire to run as little risk as possible from bad weather, and will doubtless continue to go abroad. But for week-end trips for those who live within an hour or two's journey, and also, of course, for those who live on the spot, our own hills are admirable.

Gamekeepers, shepherds, postmen, doctors, etc., who have to make journeys across the hills in all sorts of weather, are also now beginning to appreciate and use ski on the Grampians; and doubtless the custom will soon spread to other parts of the country.

The best time of the year in Scotland is in all probability the month of February, though there is often plenty of snow both before and after.

The Ski Club of Great Britain and the Scottish Ski Club have admirable arrangements whereby members are supplied with information by telegram concerning the snow in almost any part of the country, and the back numbers of the Year Books of these institutions contain a great deal of useful information about ski-ing at home. The price of the Year Books is 1s. 3d. post free, and they are sent by the Secretaries to anyone applying for them. Particulars of membership may also be obtained from the Secretaries. A letter sent to 1, Mitre Court, Temple, London, would always be forwarded.

Norway.

The sport centres in the country round about Christiania, which is within a short two day's journey of England. The district is covered with pine forest, and is undulating rather than mountainous in character. There are few hills which a good runner cannot take straight. The forests are intersected in all directions with paths which in winter are converted into ski tracks. There are also tracks through the woods made specially for ski-runners. The big jumping competition takes place at Holmenkollen, which is a hill within half-an-hour's journey of

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BESSVAND IN THE JOTUNHEIM [Photo by E. C. R.

Christiania. The date fixed is usually the end of February or the beginning of March.

Though no one visiting Norway should fail to spend some time in this neighbourhood, if only to see the thousands of ski-runners who, on a Sunday, swarm all over the country-side, and who are for the most part very clever exponents of the art, nevertheless, I should not advise anyone who wanted to learn how to go on ski to make Christiania or any place in its neighbourhood his headquarters for too long. In the first place, the snow

Photo by] [*E. C. R.*

INTERIOR OF A NORDMARKEN CLUB HUT.

supply during the earlier part of the winter is sometimes deficient, and, in the second place, when there is a snowfall it is very soon beaten down by the large number of ski-runners who cross it. A visit up country to one or other of the many sanatoria (which are simply ordinary hotels without any vexatious regulations) or to one or other of the hundreds of clean posting-stations dotted at intervals along the roads should certainly be included. In Telemarken, Gudbrandsdalen, and Oesterdalen, for instance, many such are to be found.

The best time of the year for this sort of pine-forest ski-ing is

probably February, or the beginning of March. January is also good, but the days in that month are very short, and the nights very long, in Norway.

In addition to the undulating forest country there are in Norway vast plateaus lying above the tree level from which spring the higher mountains. All this upper ground is called *fjaeld*. It is apt to be wind-swept, and human habitations occur on it only at long intervals, and are in winter, for the most part, deserted. Nevertheless, a visit to the *fjaelds* should on no account be omitted, for the ski-ing on them is often excellent, and they give

Photo by] [*E. C. R.*

SKI-SAILING ON THE FJAELDS.

one an idea of the desolation and wildness of the northern winter not otherwise obtainable. Fefor is a comfortable little place, in a fine ski-ing district on the borders of the *fjaelds*, and at Nordsaeter, near Lillehammer, and Mysusaeter, near Otta, in Gudbrandsdalen, rougher but cosy quarters are obtainable.

Another fine tract of country opened up recently by the Christiania to Bergen Railways is the Hardanger Vidden, in which there are good hotels situated at a high altitude.

A place of which I have the pleasantest of memories is Bessheim, in the Jotunheim mountains. The ski tours to be made in that neighbourhood are of surpassing beauty and interest, and

the run from the top of Besshö, across the little glacier, is one which I shall never forget.

The best time of year to go to the *fjaelds* is about the middle of March, for the days are then much longer than earlier in the year, and so longer expeditions may be taken. In April, too, the snow is usually excellent in these cold northern regions close to the big glaciers, and good ski-ing is often to be had even in June!

Photo by] [*E. C. R.*

IN THE JOTUNHEIM.

At Easter time the inns and hotels are always crowded with ski-runners.

As to equipment for the *fjaelds*, ski of the ordinary length do very well, though they should be on the long rather than on the short side. Two pairs should be taken to outlying districts, for breakages cannot be made good on the spot. The long ski mentioned on p. 59 are well adapted to this country, but are in no sense a necessity. A wind-proof coat of some sort is most desirable, and some protection for the eyes against snow-blindness is a necessity.

Maps may be obtained at Christiania; they are not very good,

but are accurate enough for practical purposes. A compass must of course be taken, as not only may one lose one's way in a fog, but even in the forests near Christiania the paths are very confusing, and it is easy to go astray if no one is at hand to give directions. Visitors to the *fjaelds* might also include a ski sail in their equipment. About 200 square feet is a suitable area for a sail for two.

The cost of living in Norway is small, running from about 5s. 6d. to 8s. 6d. per day. There is no occasion to take dress clothes.

Sweden.

The country around Stockholm is, in general, not very suitable for ski-ing, as it is too flat. There are, however, two admirable

Photo by] [*Oscar Halden.*

SKI-DRIVING.

jumping-hills. Ski-kjöring (towing behind a horse on ski) is a favourite pastime with the Swedes, and opportunities for this and for other kinds of winter sport in the way of skating, ice-sailing, etc., abound. Stockholm is also an interesting and beautiful town, and as the Swedes have quite a special reputation for kindness and hospitality to strangers, a visit to the capital is bound to be a pleasant one. The province of Jemtland, which is

easily reached by train from Stockholm, is perhaps the best ski-ing resort in the country, and a good centre is the little village of Åre (pronounced something like Awra), which has a comfortable hotel and is on the railway line between Stockholm and Trondhjem. The hills in the neighbourhood are admirable, both for long and for short expeditions. Storlien which lies a little further up the line, is also a good centre from which expeditions may be made across the frontier into Norway, and also to the Syl mountains, where there is a capital club hut.

Photo by] [*E. C. R.*

On the Swedish Fjaelds.

The general character of the country is like that of the Norwegian *fjaelds*, and the observations which have been made concerning them apply also to Sweden. The end of February and the month of March is the best season for Jemtland.

A pleasing characteristic of the Swedes is their fondness for hot baths and douches, and facilities for obtaining these are available almost everywhere. Like the Japanese, they have discovered that after a hard day's work there is nothing like a thorough soaking in very hot water for relaxing the muscles and making one feel comfortable.

In Sweden, too, as in Norway, there is an entire absence of that petty officialdom which is often so irritating in Central Europe. The Scandinavian railway-guards, station-masters, policemen, etc., being themselves ski-runners, treat you as a man, a brother,

Ski-Sailing.

and a fellow-sportsman, not as an eccentric foreigner who takes a mischievous delight in breaking the rules and regulations designed for his own and the public safety.

The cost of living is small, and varies from about 5s. 6d. to 8s. 6d. per day. Dress clothes unnecessary.

Germany.

The Feldberg, in the Black Forest, is perhaps the nearest certain ski-ing ground within easy reach of London, and as soon as travelling is a little cheaper it will be well worth while running over there for a week-end. The ground is admirable, being mostly undulating, as in Norway, with plenty of long, open hills and plenty of wood. There is a first-class jumping-hill near the hotel. February is usually the best month. On Sundays large numbers of ski-runners from Freiburg foregather on the Feldberg, and a number of these are now very skilful.

There are also in the Black Forest a great number of villages,

with clean, respectable and quaint old inns, where those who dislike a crowd may take refuge. The ground and snow are everywhere excellent. The only drawback to the district is the fogs to which it is somewhat liable.

The ordinary outfit, not forgetting maps and a good compass, are all that is necessary.

Switzerland.

The chief centres are Adelboden, Andermatt, Arosa, Davos, Engelberg, Grindelwald, Lenzerheide, Montana, St. Moritz, and

Photo by] [*N. Richardson.*

SKI-DRIVING AT DAVOS PLATZ.

Villars, to give an adequate description of which would fill a large volume. I have endeavoured, in the introduction, to give an account of a typical resort which is all that can be attempted in a book of this sort. Prices run from about 10 francs per day upwards. The Swiss ground is in general steeper than that previously mentioned, and ordinary tours take the form of climbing some mountain or pass and running back to the hotel.

In January the snow is excellent in all the places above mentioned, but in February in those lower than about 5,000 feet above sea, it is apt to be affected by the sun.

There is, of course, considerable rivalry between the different centres, and one hesitates to draw comparisons. Nevertheless,

Photo by] [*E. Freeborn.*

THE SECOND PARSENN HUT.

I cannot overlook the claims which my own favourite spot has upon me, and where I have spent so many happy days. I think that Davos as a ski-ing centre will be very hard to beat. There is a splendid jumping-hill there, and the tours to be made in the neighbourhood, if they are equalled elsewhere, are certainly not

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A STEEP MOUNTAIN SIDE. [*Photo by E. C. R.*

surpassed. The two mountain railways, the new railway up the valley, and the post which runs daily over the Fluela Pass, enable climbers of quite ordinary strength to enjoy long tours, which would otherwise be beyond their powers.

The Wolfgang to Küblis tour, *via* the Parsenn Furka, is one which nowadays is almost world renowned, for after a climb of but 2,500 feet, a run down of some 6,000 feet over the most perfect northern slopes may be enjoyed. The return to Davos is made by train, which brings one back in comfortable time for dinner.

The Austrian Tyrol

has sprung into favour within the last year or two. St. Anton, St. Christoph, Innsbruck, Kitzbühel, and Zell-am-See are perhaps the best known places.

St. Anton and St. Christoph resemble the higher lying of the Swiss resorts, the snow at St. Christoph at least being in good order till about the end of February. Both are quite small, not dress-clothes places. Zell-am-See is also informal, but at Innsbruck and Kitzbühel it is well to be prepared for society. It is said that, lying further east, these places are colder than Swiss resorts of equal altitude, but I do not think that the difference can be very great. The general character of the ground is not quite so steep as Switzerland, but steeper than Norway or the Black Forest. Many of the tours are delightful, and there are jumping-hills at all the places mentioned. To my mind, the strongest point about the Austrian Tyrol is the existence of a large number of well-found inns and club-huts scattered about all over the country, at heights of seven or eight thousand feet above sea. By using these either as centres or as temporary resting-places, one can plan out an endless series of tours on snow which must usually be good until about the middle of March, and often considerably later.

For the low-lying places some sort of aid to climbing (*e.g.*, the cord described, p. 85) is advisable, as many of the summits are most easily reached by preliminary climbs of 1,000 feet or so up narrow and steep paths. The descents, however, lie over country which is open, as a rule, though cut up in places by fences.

Conclusion.

The foregoing notes merely touch on the fringe of a subject which is really unlimited, as, in addition to those places mentioned, there are hundreds of others, all within a day or two's journey of home.

The French and Italian Alps and the Vosges, for instance, are, I am told, delightful, as also are the mountains which English

Photo by] [*E. Meerkämper.*

SERTIG DÖRFLI, NEAR DAVOS PLATZ.

geography books always speak of in one breath, the Erzgebirge, the Riesengebirge, and Böhmerwald. But I will not trouble the reader with a long list of names. Not the least of the advantages of our sport is that it draws one almost irresistibly to many lands. The ski-runner is, indeed, welcome everywhere, for not only does he do no harm to any living thing, but he often brings to the notice of the inhabitants of out-lying districts an indication of how their isolation in winter may be considerably relieved.

For a list of guide-books and periodicals, the reader may refer to the Bibliography further on. "The Winter Sports Annual," by E. H. Wroughton, is perhaps the most useful of these in the English language.

It need only be mentioned in conclusion that the chief points to be observed in planning a tour or choosing a centre are the snowfall, the height above sea, the propinquity of glaciers, the latitude, the nature of the ground, the ordinary character of the weather in winter, and the accommodation available. The reports of hotel-keepers, or even of residents who have no pecuniary interest in the districts, are naturally to be received with a certain amount of caution, for there is always a tendency to make out that the season lasts longer than it usually does. This is not by any means necessarily due to bad faith, but rather to the constitution of the mind of man, in which those memories which are pleasant and extraordinary remain, whilst those which are unpleasant or ordinary are blotted out by time.

Photo by] SKI-ING IN AUSTRALIA. *[Kerry & Co., Sydney.*

By winter mountaineering I mean mountain climbing pure and simple, in which ski may indeed be used, but only as a means of reaching some far distant and lofty peak or pass, part of which will ultimately be climbed on foot.

The subject is really foreign to a book of this sort, which is concerned with ski-ing for its own sake, and not with ski as means to an end. Nevertheless, as many mountaineers have originally taken to ski because they wished to reach their climbing grounds more easily, but who are now enthusiastic devotees of the sport, and as others may start out with the same idea and eventually change their plans and be won over to our cause, a few hints of a practical nature may be given for their benefit.

Some mention of winter-mountaineering is also necessary, if only to warn people against the notion that any special gear or any special technique is required for *ski-running* when pursued *for its own sake* in the mountains. In the chapter on outfit, attention has indeed been drawn to the fact that those whose activity is not quite what it was may do well to choose rather shorter Telemark ski for long tours on steep and difficult ground ; and that those who, for one reason or other, cannot go in for straight-running, may dispense with the groove on the bottom of the ski ; but so far as persons of ordinary strength are concerned, I can only repeat my previous advice to use

THE DAVOS SCHWARZHORN. [*Photo by E. C. R.*

May be climbed to the top on Ski from the other side.

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Telemark ski of normal length, furnished with either Ellefsen's or Huitfeldt's binding.

And the same advice applies to technique. No special methods are required, and none exist. One will indeed naturally run more carefully when a hill is covered with rocks, and when the outrun is not visible, than when all is smooth and fair going, and one will also naturally use more caution when far from home than when within a few hundred yards of the hotel doorstep; but there are no methods of managing the ski peculiar to mountainous ground.

The precautions to be adopted against avalanches, too, are precisely similar wherever there is any risk of them, whether the ground be merely hilly or Mountainous with a big M, and have already been sufficiently described.

"Ski-mountaineering" is, in fact, just ordinary ski-ing, with rocks and precipices in the neighbourhood. For after all one can only use ski where there is snow, and snow will not lie on precipices.

Nor, it may be observed, do the tours made by those who somewhat pretentiously dub themselves "ski-mountaineers" differ in general from those made by other people. The tours themselves are the same, it is only the sticks, the ski, or the boots which may be different.

Winter Mountaineers may, however, be sharply distinguished from ski-runners by the fact that the object of the former is the ascent of such and such a peak or pass, the means adopted being entirely subservient to the end. And from this point of view, it is easy to give the prospective climber a few hints about his ski-ing outfit.

To begin with, he will find ski much better suited to his purpose than Canadian snow-shoes or Schneereifen. Both of these have been tried repeatedly, but without much success. The ski chosen should be of ordinary Telemark type, but should be considerably shorter than for ordinary use (see pp. 63 and 64). Their running surfaces should, I think, be clad with a fixed covering of sealskin. The fixed sealskin is a saving in weight as against the removable kind, and is, to my mind, more satisfactory in every way for this sort of

work. It is difficult to say just how much energy it saves uphill, but there is a very general agreement that it saves a good deal. The skin checks the speed somewhat when running down, but the difference it makes in that respect is not so very great. The groove being covered with skin, straight running is difficult, and turning is easy.

As regards bindings, I recommend Ellefsen's, or Huitfeldt's with the Ellefsen clips. The ease with which Huitfeldt's so furnished can be taken off and on, and also its extreme simplicity and compactness, are strong claims in its favour, and if the runner can succeed in fitting it to his boots and keeping it so fitted, I think it is undoubtedly the best.

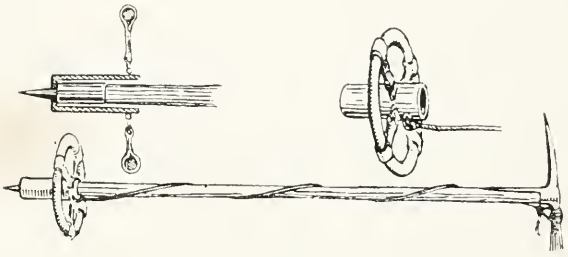

Fig. 72.

The ice-axe makes a first-rate ski stick, its business end for ice-cutting purposes being held in the hand. Some sort of covering for the metal is desirable. Fig. 72 shows an arrangement whereby a detachable disc can be fitted to it. The disc is fixed to a metal cone which slips over the point of the stick and is held in place by a string attached to the axe.

As to boots, the best arrangement has, after a deal of experimenting, been found to be the ordinary mountaineering boot of such a size as to take an extra pair of thick socks (ladder). It is true that both bindings and ski are apt to suffer from the nails, but the damage done is less than one might expect, and does not warrant the carrying of extra weight to prevent its occurrence.

Some sort of sling for carrying the ski is, of course, a necessity, and will be called into requisition when climbing up rocks, and on

very rough roads. On ordinary roads the ski may be towed without much damage to the sealskin.

If glaciers are to be crossed in which there are crevasses, a rope should be used ; for though the crevasses are better bridged in winter than in summer, and though, owing to the greater distribution of the weight, they are less likely to break when ski are worn ; nevertheless, they are as a rule more effectually concealed in winter. Uphill, the rope presents no difficulty, but downhill it is apt to be troublesome. The best plan seems to be for the party to rope in pairs, for if all the members of a party rope together they are very apt to get in each other's way. The management of the rope is simply a matter of ordinary ski-ing ability. Two good runners roped together can after a little practice manage very well, whereas two duffers will, of course, aways be tripping one another up.

The rest of the outfit suitable for winter-mountaineering calls for no special remark, for it will resemble in every respect that which mountaineers are accustomed to carry with them in summer.

Photo by] [*E. C. R.*

FROM AN ALPINE PASS.

The Ski Club of Great Britain has not yet drawn up any rules to govern competitions. On the one occasion on which, till the present (1909), regular competitions were held, the Swiss rules were adopted. The Swiss rules differ somewhat from the German rules, which, in turn, are not quite the same as those in vogue in Norway.

To set forth all these rules in detail would take up too much space here, and would, moreover, hardly serve any useful purpose, as there is at present a prospect of an International Ski Association being formed, with one set of rules.

In principle, however, all the rules are somewhat similar.

In all countries the blue ribbon of a ski-meeting goes to him who excels most, both in cross-country running and in jumping.

Efforts have from time to time been made, both in Norway and on the Continent, to popularize turning competitions, but these have so far met with but little success. The practical difficulties seem to be too great. On the Continent so-called "style" competitions have had some little vogue. In these the competitor has usually been required to make downhill curves, Telemark and Christiania swings before judges, who have awarded marks on some more or less fixed principle. They have never been very successful, partly because they are uninteresting to watch, and partly because of the great difficulty in judging just the right amount of importance to be attached to the speed at which the swings, etc., are executed. Competitor A, for instance, executes a swing very prettily at a slow pace, whilst Competitor B, travelling at a great speed, loses his balance just before the swing

is completed. How shall they be judged ? Nobody knows, but it is now very generally realized that competitions of this kind cause more grumbling than they do good to the sport.

In Norway, too, efforts are sometimes made to hold turning competitions. In these a downhill curly course is mapped out, with plenty of sharp turns, and he is adjudged the winner who gets down in the shortest time. One is free to turn the corners in any way one pleases. This seems admirable, provided that there is plenty of snow on the course, that the corners are such that the competitors must turn them, and that suitable arrangements for timing are possible ; but, for some reason or other, such competitions have not been popular. These downhill races are sometimes called in that country " Slalaam," a mysterious word hailing from Telemarken, which seems to mean anything from curving downhill with the stick to leaping over a series of natural jumps.

All things considered, however, there seems to be little occasion for turning competitions of any kind ; for cross-country running and jumping alone afford quite sufficient test of ski-ing prowess. He who can jump 30 metres, and who can also slide fast and well in the long-distance race, will almost, as a matter of course, be able to execute all kinds of swings and turns.

Distance races are now usually fixed at about ten miles, and the course is laid up hill and down dale, through woods and across open spaces. In the early days of the sport in Switzerland the usual plan was to choose some far-distant peak, and set the competitors to climb that and run back, the downhill course being often led over the most broken ground to be found in the neighbourhood. This practice has, however, now been abandoned, it being generally realized that the object of a distance race is to select the best ski-runner for all-round work, who is not necessarily the man with the largest lungs, who rides his stick best, or he who can stand the most bashes on the head from collisions with trees and rocks.

Alternating up and downhill courses, such that it is possible for a first-class runner to follow them at top speed without falling, are found by experience to be the most useful.

The competitors are started one after another, and their times are taken.

The method of giving marks for the distance race, in order that it may be combined with the jumping competition, is as follows :—

Before the race has been run, the judges go over the course, and after the race has been run they fix a so-called "maximum" time. This they determine from the state of the snow, times actually achieved, etc., etc. Anyone covering the course in a time which exceeds the maximum is disqualified. The competitor who covers the course in the maximum time receives a certain number of marks, usually four. The competitor who covers the course in the quickest time receives one mark. The marks which the other competitors receive are ranged between the best man's mark (one) and maximum time man's mark (four) in proportion to the number of minutes and seconds they fall short of the quickest time. Thus, suppose 60 minutes represents the maximum time and 45 minutes the best man's time, and suppose a man covers the course in 46 minutes, then—

The best man's mark is 1,

The worst man's mark is 4.

and the difference in time is 15 minutes ; so that $\frac{3}{15} = .2$ marks have to be added to 1 for every minute a competitor is behind the best man.

Hence, the 46-minute man's mark is 1·2.

The jumping competition is marked in a similar manner, the mark 1 being commonly given to the most skilful, and the mark 6 to the worst, and he is adjudged the winner of the *combined* events whose marks for the distance race and the jumping, when added together, come to the smallest figure. The precise method of marking the jumping varies, however, in different countries, and does not seem to afford unqualified satisfaction in any of them. The question at issue is the respective importance to be attached to length of jump and style.

The following is a translation of the Norwegian rule on the subject :—

" In the giving of marks regard shall be had to the perform-

ance of the ski-runner from the time that he leaves the top of the hill till he stops at the bottom, after finishing his run. Special weight is to be laid on a safe and elegant management of the ski as well as on a supple but quiet, controlled, and collected management of the body. *Decisive weight should not be laid on the length of the leap in proportion to the rest of the performance, and length should, accordingly, only be taken into account in cases of doubt. Nevertheless, special regard must be taken as to whether the length of the jump lies to an appreciable extent over or under the average.*

"The judges give marks for the jumping competition from 1 to 6, reckoned to one place of decimals."

The part of these rules marked in italics is not free from ambiguity, and there is in Norway itself, as well as on the Continent, a considerable difference of opinion as to what style is best. Herr Huitfeldt goes so far as to say that he would simply disqualify anybody who did not jump with the points of the ski pointing downwards ; whilst others consider this position to be dangerous and undesirable. Nor is there in Norway any fixed rule as to the value to be attached to a jump after which the runner falls. Under the German and Austrian rules, a falling jump does not count, and under the Swiss rules 4 is the best mark which can be obtained. In Norway, however, a falling jump is sometimes marked as highly as 3.

Then there are the two styles of jumping, known as the " rak " and the " optraek," in the former of which the leaper is straight in the air, whilst in the latter he draws up his feet. In Norway the " rak " style commonly receives about half a mark more than the " optraek," nominally because it is the prettier to look at, but, in all probability, really because it is more conducive to standing jumps.

In Norway, and, indeed, for the most part, elsewhere, the existing rules have worked well, for the judges, who, under every system, have had a wide discretion as to style, have usually themselves been first rate ski-runners, in whose judgement competitors and public alike have reposed complete confidence. There has, indeed, in practice been an astonishing unanimity in

the marks awarded by judges to different competitors. Recently, however, some dissatisfaction has been felt. The general opinion in Norway is that under the existing rules the man who jumps short is not sufficiently penalized, whilst insufficient marks are often given for length. Twenty metre leaps at Holmenkollen are the rule, but 30 metre leaps the rare exception ; and every leaper knows how much easier it is to stand prettily for a short distance than to stand at all for a long. A further difficulty, too, is sure to arise in international competitions now that continental ski-runners have become a factor to be reckoned with. The judges will necessarily require to be a mixed tribunal, and experience in other sports has shown that mixed tribunals, even when points of style are far more definitely fixed than in ski-jumping, seldom or never give satisfaction. In international competitions two difficulties will inevitably present themselves : firstly, that of coming to a clear understanding and agreement as to what good style really is, and, secondly, that of ensuring conformity on the part of the judges to the standard fixed.

No solution of the first of these difficulties other than a compromise is possible, and as to the second—well, human nature is human nature, and a judge, even without intending to do so, is apt to look upon his own countrymen with too favourable eyes.

It is, therefore, pertinent to enquire whether there may not be a simple solution of the difficulty by abolishing style altogether, and marking by length and certainty (that is to say, standing rather than falling) alone. One might, for instance, deduct 25 per cent. for a falling jump ; a standing jump of 32 metres would thus count as 32, no matter what the style was, but only as 24 if the leaper fell. There could, of course, be no talk of strictly accurate measurement, any more than there can be in the case of long jumps on foot. But that would not be a serious difficulty, for all jumps might be reckoned to the nearest metre, and competitors within a metre of one another might be held to tie.

I ventured to put forward this scheme in a German paper last winter, but so far it has received little or no acceptance. To abolish style would be, it is said, too revolutionary, and would,

moreover, tend to debase jumping into a mere exhibition of brute strength. To this I cannot agree. My proposal would not, I think, effect any drastic change. By penalizing a falling jump competitors would be effectually prevented from recklessly hurling themselves from the take-off, for it simply would not pay them to do so. At the same time, they would be encouraged to leap as far as their powers permitted. We should indeed not improbably see some new styles of jumping ; but surely that would not be an objection, for competitions as at present managed are apt to present a certain degree of monotony, one man jumping very much like another. Again, though particular styles might differ to some extent, style in general would by no means be abolished, merely because marks would not be given for it. A parallel may be found in rowing, in which style is of the highest importance, and insisted upon to an extent greater perhaps than in any other sport. There are, however, many different styles of rowing, each crew, in fact, developing some peculiarity of its own. But in rowing no one dreams of awarding marks for style, that style being always held to be best which is most conducive to speed. And so, I think, it should be with ski-jumping. That style should be held to be best which is most conducive to length and stability, and these factors alone should be considered at competitions.

Photo by] [*E. C. R.*

A Boys' Race.

The following is based on what appears in Dr. Paulcke's "Der Ski-lauf" on the subject. Dr. Paulcke's directions have been adopted by the M.E.S.V. (Middle European Ski Association), and my thanks are due to him for leave to use them.

Anyone who has some little skill in handling plane and saw is in a position to make good serviceable ski for himself. He should set to work in this wise :—

In the choice of wood he will be directed by what is most easily to be had in the neighbourhood.

In addition to ash and hickory, the following are quite serviceable :—Cherry, walnut, acacia, elm, birch and fir. Birch and fir (particularly the latter), being somewhat soft, should, if employed, be worked somewhat larger than the dimensions given, which are for ash or hickory.

Directions as to the choice of good ash have already been given (pp. 46-51). It is sufficient here to note that the wood should be as free as possible from knots, that it should be cut in winter, when the sap is not flowing, and that it should be thoroughly and slowly dried. Good planks of such wood, somewhat longer and wider and deeper than the ski to be made, are then selected.

The plan of the ski is drawn upon the boards in pencil, as shown (Fig. 73), and the ski sawn out. As in the sawing out a certain amount of wood is always lost, and also to allow for any subsequent "casting"—*i.e.*, twisting—the dimensions should be taken somewhat larger than finally intended. Care should also be taken that the points of the ski lie in that part of the plank which grew uppermost in the tree, so that the grain runs from point to heel, and not *vice versa*.

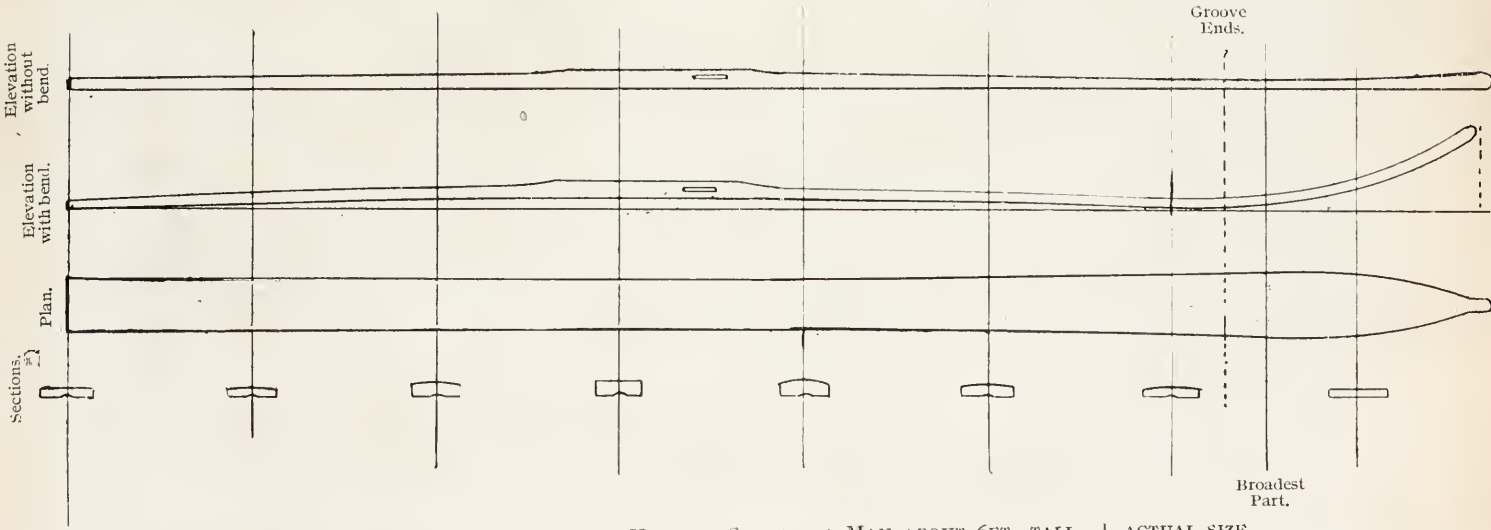

Fig. 73.—Design for an Ash or Hickory Ski for a Man about 6ft. tall, $\frac{1}{12}$ actual size.

The arched groove running along the bottom is $\frac{1}{2}$-in. wide by $\frac{1}{12}$-in. deep. Greatest thickness in middle, $1\frac{1}{16}$-in.; least thickness at ends, bend, $\frac{5}{16}$-in. Total rise of bend, 5-in. Total rise of arch, $\frac{3}{4}$-in.

After the plan has been sawn out, the elevation of the ski is then drawn in on the sides of the plank (see Fig. 73). The elevation should be drawn and cut out so that the future running-surface of the ski is not hollowed out in any way; that is to say, all the shaping must be done by cutting the future upper surface. The grain on the running surface must run quite smoothly from toe to heel.

The shaping of the ski should not be carried too far at this stage, the finishing-off being done after the bends have been made. There are, as we have already noted, two bends in a ski, one running throughout its length and the other at the point. As

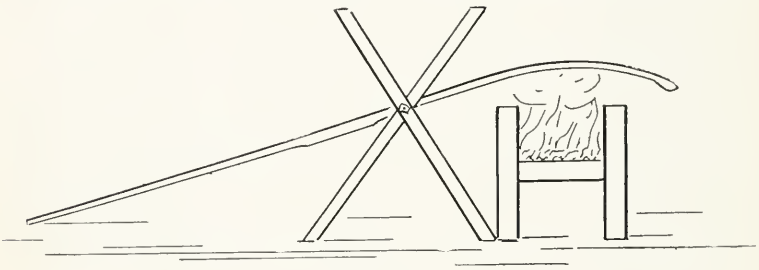

Fig. 74.

far as amateurs are concerned, these should *not* be made by steaming, as bends so made are apt to lose their form.

The best plan is to bend the ski by hand over a small wood charcoal fire in the following manner:

A small hearth is constructed, as shown in Fig. 74, by means of fire-proof bricks. The hearth should be about two bricks long and one brick broad. Beside this hearth a firm support of some kind is prepared for the ski. The support is arranged in such a manner that the part of the ski to be bent does not lie too high above the hearth, but comes just over the burning charcoal. The ski is then placed as shown in the diagram, with the running-surface uppermost. A damp cloth is next laid along the running-surface of the ski where the bend is to be made. The ski is then held firmly on the support with the left hand, and the point is bent downwards with the right till the right

degree of bend is obtained. In order that the bend may be made as evenly as possible, the point of the ski and with it the damp cloth is drawn over the hearth so that the heat may take effect all along the part to be bent. Great care should be taken not to make the bend too sudden. It should be gentle and gradual, as shown, Fig. 73.

As soon as the bend is finished, the damp cloth is taken away, and the ski allowed to dry over the fire, whilst the point is held down in the right position by hand.

In a similar manner the curve throughout the length of the ski may be made, taking care that it be not exaggerated (cf. p. 54). These operations are, of course, more easily performed by four pairs of hands than by two.

After the bends have been made, the hole is then carefully bored out in the exact place, shown in the diagram.

The ski are then best left alone for some weeks, in case any slight warping of the wood declares itself, after which they may be finished off. The groove, which runs from the place where the bend merges with the main body of the ski to the heel, and which is three-eighths of an inch wide and one-twelfth of an inch deep, may be made with a plane which carpenters use for such purposes.

The ski is then rubbed all over with linseed oil to which a small quantity of paraffin has been added to help the oil to penetrate the wood. As many coatings may be given as the wood will hold. Finally, the upper surfaces and sides are varnished, and the ski is ready for use.

Fig. 75.

Mr. C. R. Wingfield sends me the following notes as to how birch ski are made in some parts of Norway. A straight, clean birch is selected, cut down (of course, in winter), and roughly squared with an axe. It is left to dry for a month or two. It is then split with axe and wedges down the centre for a distance of about two-thirds of its length. The outer surface then " draws " the ends, as shown (Fig. 75), and the result is two long pieces

slightly curved. The longitudinal curve in the ski is thus formed without the aid of fire or steam. The ski are then put away for, say, three months to dry, after which they are roughed out into two-inch planks, and left to finish drying and "casting."

English birch goes on casting for six months or more, especially after working, so that it is advisable to work the ski down bit by bit, and so be able to take out any twist which may develop. Birch should be worked about a half-inch thicker than ash, as it is not so tough. It is, however, considerably lighter.

The bend may be made as above described.

From the foregoing it will be noticed that the most important thing to be observed in making home-made ski, or indeed, any ski, is to obtain thoroughly well-seasoned wood and to spread out the operations of shaping it over as long a time as possible. In this way only is it possible to obtain ski which will not warp. Nothing in the nature of artificial heat must be employed in the drying operations.

The most difficult thing is probably to secure a good bend.

Dr. Paulcke assures me that his method works well in practice, but in case anyone should find that the bend so made is not quite satisfactory, it might be worth while trying to make it in two operations. The wood might in the first instance be damped, when still in the rough, and bent round to a greater extent than finally intended. It might be left like this in a damp state for some weeks or months, after which it might be thinned down and bent back over the charcoal fire to just the right extent. Some such method as this is employed in Norway, though the details are a jealously-guarded trade secret.

As to home-made bindings, I think Huitfeldt's, with the long thong (see p. 71), is the simplest and most generally useful.

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ON THE WAY UP THE PEISCHELKOPF. [*Photo by E. C. R.*

So many people carry a camera nowadays that a few hints on the above subject may be found useful.

For rapidly moving figures, as in jumps, swings, etc., a focal-plane shutter is necessary; but the focal-plane shutter as at present constructed is open to the very serious drawback that the indiarubber used in the blind is affected by cold, and, consequently, the shutter is apt to stick. For ordinary touring, a before-the-lens shutter of good construction is best. Quarter-plate is, I think, the most convenient kind of camera. Despite the slight extra weight involved, I myself prefer plates to films. Half-a-dozen quarter-plates in three well-made dark slides weigh, after all, very little, and on a ski tour one seldom requires more. I carry my camera in a thick, envelope-shaped velvet bag, with two divisions in it, one for the camera, the other for the dark slides. A piece of tape is sewn along the top of the envelope to form a loop, so that I can hang the apparatus round my neck and have my hands free when at work. The whole goes into the rucksack, and though I have fallen with it many times, so far it has only once been broken, and that was when it came into violent contact with a tree, which was not exactly fair play.

The plates should be of the backed orthochromatic kind, and should be used in conjunction with a suitable screen. I find Wratten's panchromatic plates, in conjunction with their K screens, admirable. An ordinary plate does not distinguish sufficiently between the blues (sky and shadows) and the whites in a snowscape, and the reds (*e.g.*, in ski-runners' faces) come out quite black. For most snow subjects I find an exposure of 1/15 sec. at F6, with the K2 screen, is about right. One must, of course, be very careful not to shake the camera.

The panchromatic plates have to be handled in complete darkness, for they are sensitive to red light, but the operation is perfectly simple, and need not cause misgivings to anybody. I find, moreover, that so long as I keep the plates in the shadow of my body when changing them, a little red and even a very little white light (*e.g.*, from the moon or a street lamp outside) does no harm. I develop with rodinal 1 – 24 for about four minutes at 60 degrees F. in a papier-mâché dish which has four divisions in it, and cover the dish with the lid of a cardboard box during the development. When time is up I rinse round the plates with water and fix them in the same dish with hypo acidified, with a few crystals of metabisulphite of potassium. The hypo and washing water should be at about the same temperature as the developer, or frilling may result. The plates are subsequently washed in the same dish. Minute traces of hypo *may* be left adhering to the dish, but if so, nothing dreadful ever happens. The operations may be conducted anywhere at night, and no special dark room is necessary.

The following is a selection of books, periodicals, etc., dealing with ski-running, most of which are taken from Dr. Henry Hoek's "Die Schi-literatur," published by Gustav Lammers, München, Germany. Readers who desire a more exhaustive list are referred to that work, which is printed in paper cover form, and occupies 20 pages.

Books of history, geography, etc., in which ski-running is mentioned at some length :

c. 1200 Saxo Grammaticus.

1555 Magnus (Olaus), "Historia de gentibus Septentrionalibus. Rome. Contains numerous pictures of ski-running, in all of which the back end of the ski is missing. Description of a ski race meeting ; a hunt of Laplanders on ski, etc.

1673 Schefferus (Joannes), "Joanni Schefferi Argentoratensis Lapponia id est regionis Lapponum et gentis nova et verissima descriptio," etc., etc. Francofurti.

1689 Valvasor (Johann, Weichard), "Die Ehre des Hertzogthums Crain : Das ist wahre, gründliche und recht eigentliche Bellgen und Beschaffenheit," etc., etc. Laybach. Description of the ski-running of the Krain peasants, directions for the manufacture of ski, etc., etc.

1712 Berckenmeyer (P. L.), "Vermehrter Curieuser Antiquarius." Hamburg. Good picture ; new editions : 1720, 1731, 1738, 1746.

1802 De Jong. Reizen naar de Kaap de goede Hoop Irland en Noorwegen in de jaren 1791-1797. Good pictures.

1827 Brooke (Sir Arthur de Capell), "A Winter in Lapland and Sweden." London.

1864 Tomlinson (Ch.), "The Raincloud and the Snowstorm." An account of the nature, formation, properties, dangers, and uses of rain and snow. London.

1871 Bush, "Reindeers, Dogs, and Snowshoes." New York.

1890 Nansen (Fr.), "Paa Ski over Grönland"; en skildring af den Norske Grönland-Expedition, 1888-89. Christiania.

1890 Nansen (Fr.), "The First Crossing of Greenland." 2 vols. London.

1891 Nansen (Fr.), "Auf Schneeschuhen Durch Grönland." 2 vols. Hamburg.

1896 Mason (O. T.), "Primitive Travel and Transportation." Washington.

1898 Conway (Sir M.), "With Ski and Sledge over Arctic Glaciers." London.

1898 Nansen (Fr.), "In Nacht und Eis." Mit einem supplement von Nordahl (Wir Framleute), und Johansen, "Nansen und ich auf 16° 14′." 3 vols. Leipzig. Also in Norwegian and English.

1901 Lessenthin (B.), "Das Riesengebirge im Winter." Breslau.

1909 Syers (E.), and Syers (M.), "The Book of Winter Sports." London.

Year books, journals, and newspapers dealing specially with the sport:

"Aarbog"—The Year Book of the Norwegian Ski Association. First volume appeared 1894.

"Paa Skidor"—Ditto for the Swedish Ski Association. First volume appeared 1896.

"Annual Report of the National Ski Association of America." Wisconsin. First number, 1904.

"Year Book of the Ski Club of Great Britain." London. First number, 1905.

"Ski"—Year Book of the Swiss Ski Association. First number, 1908.

"Deutscher Wintersport"—A journal appearing four times a month during the winter since 1901. The official organ of a number of German clubs.

"Schnee"—Organ of the Alpen Ski Verein. Appears twice a month since 1905.

"Der Winter"—A weekly paper connected with the Deutsche Alpenzeitung since 1906.

" Alpiner Wintersport "—Official organ of the Ski Club, Bern. Weekly for one season, 1903, and three numbers of the second season. Was continued as :—

" Ski," with official supplement, " Allgemeines Correspondenzblatt " ; also " Alpiner Wintersport," organ of the Swiss Ski Association (1904-05), and since 1905 of the Middle European Ski Association. Was re-baptized in 1906 into :

" Alpinismus, Wintersport, und Ski," with official supplement : " Allgemeines Correspondenzblatt." Basle. Alpinismus und Wintersport published every fortnight. " Ski " sixteen times in winter. Was amalgamated in October, 1907, with the " Deutsche Alpenzeitung " and " Winter," since which time it has disappeared.

" Ski "—" Correspondenzblatt " of the Swiss Ski Association. Basel. Since 1907.

" Scottish Ski Club Circular "—Since 1907. Dundee.

" The Alpine Ski Club Annual." London. Since 1908.

" Scottish Ski Club Magazine." Edinburgh. Since 1909.

The two following papers contain a great many ski articles :

" Oesterreichische Alpen-Zeitung," of the Austrian Alpine Club, contains more ski articles than any other Alpine paper. Particulars of tours partly of pioneer work on ski in the Eastern and Western Alps.

" Deutsche Alpen-Zeitung," München, contains many detailed essays and numerous excellent pictures.

" Alpine Journal."—See May, 1903, Rickmers' " The Alpine Skee and Mountaineering " ; also February, 1907, Hoek on " Snow Avalanches," and August, 1909, Clarke (R.), " Mountaineering on Ski."

" The Scottish Mountaineering Club Journal."—See vol. viii., No. 45, Rickmers' " Aquatic Sport on Ben Nevis," and Allan (Arthur), " Ski-Running in Scotland."

" The Field."—See first number for February, 1878, Forster (F. W.), " Snow Skating " ; also the second number for March, 1888, " Icicle " (D. M. M. Crichton Somerville), " The Norwegian Ski " ; and in recent years many articles throughout the winter months.

The following are books and articles specially dedicated to ski-running:

1865 Wergeland (J. F. O.), "Skilöbningen dens Historie og Anvendelse," etc. Christiania.

1893 Urdahl (L.), "Haandbog i Skilöbning." Christiania.

1896 Huitfeldt (Fr.), "Laerebog i Skilöbning." Christiania.

1896 Lillehagen (E.), "Skilöbning, praktiske Wink og Erfaringer." Christiania.

1897 Zdarsky (M.), "Die Lilienfelder Skilauf Technik." Hamburg.

1898 Seidel (H.), "Der Schneeschuh und Seine Geographische Verbreitung" (Globus 12 märz). Braunschweig.

1899 Paulcke (W.), "Der Skilauf." Seine Erlernung und Verwendung im Dienste des Verkehrs, sowie zu touristischen, Alpinen und Militärischen Zwecken." Freiburg i/B.

1901 Paulcke (W.), "Der Skilauf in den Alpen." (Extracts from communications to the German and Austrian Alpine Association.) Vienna.

1903 Paulcke (W.), "Der Skilauf, etc." Second edition.

1903 Zdarsky (M.), "Alpine (Lilienfelder) Skilauf Technik." Second edition. Hamburg.

1904 Richardson (E. C.), Rickmers (W. R.), Crichton Somerville (D. M. M.), "Ski-Running." London.

1905 Richardson (E. C.), Rickmers (W. R.), Crichton Somerville (D. M. M.), "Ski-Running. Second edition. London.

1906 Hoek (H.), and Richardson (E. C.), "Der Ski und Seine Sportliche Benützung." Munich.

1906 Bernard (G.), "Etude sur le Ski" (extract from "La Montagne," 20th May).

1906 Rivas (Capt.), "Petit Manuel du Skieur." Briançon.

1907 Richardson (E. C.), Rickmers (W. R.), Crichton Somerville (D. M. M.), "Ski-Running." Second edition, reprint. London.

1907 Möller (P.), "Om Skidlöpning." Stockholm.

1907 Bertani (F.) and Rossini (A.), "Vademecum dello Skiatore." Milan.

1907 Hoek (H.), "Wie lerne ich Schilaufen?" Munich.

1907 Hoek (H.) and Richardson (E. C.), "Der Ski und Seine Sportliche Benützung." Second edition. Munich.

1908 Paulcke (W.), "Der Skilauf," etc. Fourth edition. Munich.

1908 Hoek (H.) and Richardson (E. C.), "Der Schi und Seine Sportliche Benützung." Third edition. Munich.

1908 Huitfeldt (F.), "Skilöbning i text og Billeder." Christiania.

1908 Huitfeldt (F.), "Das Skilaufen." Berlin.

1909 Zdarsky (M.), "Skisport." Vienna.

1909 Richardson (C. W.), "Eight Ski Cards." London.

1909 Zdarsky (M.), "Alpine (Lilienfelder) Ski-Fahr-Technik." Fourth edition. Vienna.

1909 Hoek (H.), "Wie lerne ich Schilaufen?" Second edition. Munich.

1909 Hoek (H.) and Richardson (E. C.), "Le Ski." Traduit par L. Arnaud. Grenoble.

1909 Fendrich (W.), "Die Skiläufer." Stuttgart.

The following are guide-books which may be found useful:

1901 Somerville (Cr.), "The Most Picturesque Routes in Southern Norway" (see pp. 63-68). Edited by the Skien Telemarks Tourist Club.

1903 Academischer Ski-Club München, "Ski touren um München." Munich.

1905 Sehrig (O.), "Skiführer durch Tirol." Innsbruck.

1906 Kehling (J.), "Winter Sport im Riesengebirge."

1906 Roll (K.), "Winter in Norwegen." Also in English and French; published by the "Forening for Reiselivet, Norge." Christiania.

1906 Balck (V.), "Winter Sport in Schweden" (pp. 99-110 from "Schweden, im Kurzer Führer.") Stockholm.

1906 Academischer Ski-Club, München, "Ski führer für das Bayerische Hochland." Second edition of the "Ski touren im München." Munich.

1906 Oesterreichischer Alpen Club, "Ski touren im den Ost-Alpen." Edited by Biendl (H.), Radio-Radiis (A. V.). Vienna.

1906 Wroughton (E.), "The Winter Sports Annual." London.

1907 Richardson (W.), Eight Ski Cards. London.

1908 Reisch (F.), "Schitouren um Kitzbühel." München.

1908 Hoek (H.) und Wallau (H.), "Schifahrten im Südlichen Schwarzwald." Munich.

1909 Rickmers (W. R.), "Ski-ing for Beginners and Mountaineers." London.

There are a number of books and essays dealing with ski when used for military purposes, amongst which may be mentioned :

1836 Brooke (Sir A. de Capell), "The Skating Soldiers of Norway." London. ("The Saturday Magazine," 9th January.)

1907 Czánt (H.), "Militair-Gebirgsdienst im Winter." Vienna and Leipzig ; also translated into French by H. A. Tanner, Paris, 1908.

The following deal with snow and avalanches :

1881 Coaz (J.), "Die Lawinen in den Schweizer Alpen." Bern. Cheap second edition, 1888.

1885 Zsigmondy (E.), "Die Gefahren der Alpen." Leipzig. (Chapter 2, Von den Schnee und Eis-Lawinen). New editions. Innsbruck.

1892 Dent (C. T.), "Mountaineering." London. (Chapter on "Snow-craft," 149-215). Third edition, 1900.

1903 Zavattari, "Rapport sur les Experiences faites sur la Neige en Italie pendant ces dernières années." Paris. Contains a long chapter on the use of ski.

1907 Abraham (G. D.), "The Complete Mountaineer." London. (Chapter, "The Dangers of Mountaineering.")

1908 Zsigmondy-Paulcke, "Die Gefahren der Alpen." Fourth revised edition of the elder Zsigmondy. Innsbruck.

USEFUL FACTS AND FIGURES.

1 inch	= ·0254 metres	1 metre	= 39·370 inches*
1 foot	= ·3048 metres	,,	= 3·280 feet
1 yard	= ·9144 metres	,,	= 1·0933 yards
1000 metres	= 3280 feet	1 kilometre	= 1093·3 yards
1000 feet	= 304·8 metres	8 kilometres	= 4·969 miles
		,, ,,	= 5 miles, less 50 yards

* The exact figures are not as yet settled, and are given—39·37043196, 39·37079, 39·37008, &c.

FRANCE AND SWITZERLAND AND ITALY.

£4	= 100 francs	100 francs	= 80/-
4/-	= 5 francs	5 francs	= 4/-
1/-	= 1·25 francs	1 franc	= -/9½ about

NORWAY, &c.

£1	= 18·2 kroner	1 krone	= 1/1¼ about

GERMANY.

£1	= 20·4 marks	1 mark	= -/11¾ about

AUSTRIA, &c.

£1	= 24 kronen = 10·2 florins or gulden	1 krone 1 florin or gulden	= -/10 = 1/11½

1 kilogramme = 2·2046 pounds avoirdupois.
In trade 1 kilogramme is reckoned 10 per cent. more than 2-lb.
11-lb. = 5 kilogrammes.

Temperature falls about
1° Fahrenheit for every 300-ft. rise,
or, say,
1° Cent. for every 200 metres.

Variation of the Compass.—In Switzerland the true north is shown on the compass as about north-by-east. In Scandinavia the compass varies locally.

Alpine Signal of Distress.—Make six signals of any kind in a minute. Wait a minute and repeat. The answer consists in making three signals in a minute, waiting a minute and repeating.

THERMOMETER.

Comparison between Scales of Fahrenheit, Réaumur, and the Centigrade.

Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't.	Rmr.	Cent.	Fah't	Rmr.	Cent.	Fah't.	Rmr.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
100B.	212B.	80B.	75	167	60	50	122	40	25	77	20	Zero	32	Zero	25	13	20
99	210.2	79.2	74	165.2	59.2	49	120.2	39.2	24	75.2	19.2	1	30.2	0.8	26	14.8	20.8
98	208.4	78.4	73	163.4	58.4	48	118.4	38.4	23	73.4	18.4	2	28.4	1.6	27	16.6	21.6
97	206.6	77.6	72	161.6	57.6	47	116.6	37.6	22	71.6	17.6	3	26.6	2.4	28	18.4	22.4
96	204.8	76.8	71	159.8	56.8	46	114.8	36.8	21	69.8	16.8	4	24.8	3.2	29	20.2	23.2
95	203	76	70	158	56	45	113	36	20	68	16	5	23	4	30	22	24
94	201.2	75.2	69	156.2	55.2	44	111.2	35.2	19	66.2	15.2	6	21.2	4.8	31	23.8	24.8
93	199.4	74.4	68	154.4	54.4	43	109.4	34.4	18	64.4	14.4	7	19.4	5.6	32	25.6	25.6
92	197.6	73.6	67	152.6	53.6	42	107.6	33.6	17	62.6	13.6	8	17.6	6.4	33	27.4	26.4
91	195.8	72.8	66	150.8	52.8	41	105.8	32.8	16	60.8	12.8	9	15.8	7.2	34	29.2	27.2
90	194	72	65	149	52	40	104	32	15	59	12	10	14	8	35	31	28
89	192.2	71.2	64	147.2	51.2	39	102.2	31.2	14	57.2	11.2	11	12.2	8.8	36	32.8	28.8
88	190.4	70.4	63	145.4	50.4	38	100.4	30.4	13	55.4	10.4	12	10.4	9.6	37	34.6	29.6
87	188.6	69.6	62	143.6	49.6	37	98.6	29.6	12	53.6	9.6	13	8.6	10.4	38	36.4	30.4
86	186.8	68.8	61	141.8	48.8	36	96.8	28.8	11	51.8	8.8	14	6.8	11.2	39	38.2	31.2
85	185	68	60	140	48	35	95	28	10	50	8	15	5	12	40	40	32
84	183.2	67.2	59	138.2	47.2	34	93.2	27.2	9	48.2	7.2	16	3.2	12.8	41	41.8	32.8
83	181.4	66.4	58	136.4	46.4	33	91.4	26.4	8	46.4	6.4	17	1.4	13.6	42	43.6	33.6
82	179.6	65.6	57	134.6	45.6	32	89.6	25.6	7	44.6	5.6	18	—	14.4	43	45.4	34.4
81	177.8	64.8	56	132.8	44.8	31	87.8	24.8	6	42.8	4.8	19	2.2	15.2	44	47.2	35.2
80	176	64	55	131	44	30	86	24	5	41	4	20	4	16	45	49	36
79	174.2	63.2	54	129.2	43.2	29	84.2	23.2	4	39.2	3.2	21	5.8	16.8	46	50.8	36.8
78	172.4	62.4	53	127.4	42.4	28	82.4	22.4	3	37.4	2.4	22	7.6	17.6	47	52.6	37.6
77	170.6	61.6	52	125.6	41.6	27	80.6	21.6	2	35.6	1.6	23	9.4	18.4	48	54.4	38.4
76	168.8	60.8	51	123.8	40.8	26	78.8	20.8	1	33.8	0.8	24	11.2	19.2	49	56.2	39.2

THROUGH THE WOODS. [*Photo by E. C. R.*

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